JULY 1952
No. 183

ASTM Bulletin

NEWS—50th Anniversary Meeting—Sessions, Committee Meetings. New Tentatives, Awards, Medals; New District Councilors.

PAPERS—President's Address; Effect of Shot Peening on Cavitation Damage; Electron Microscope Metallography; Size-Frequency Distribution of Subsieve Particles; Extraction Test for Polyvinyl Chloride Elastomers.

American Society for Testing Materials

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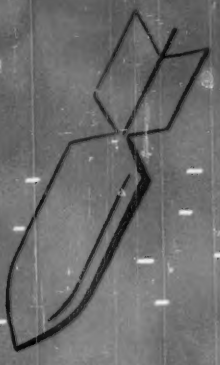

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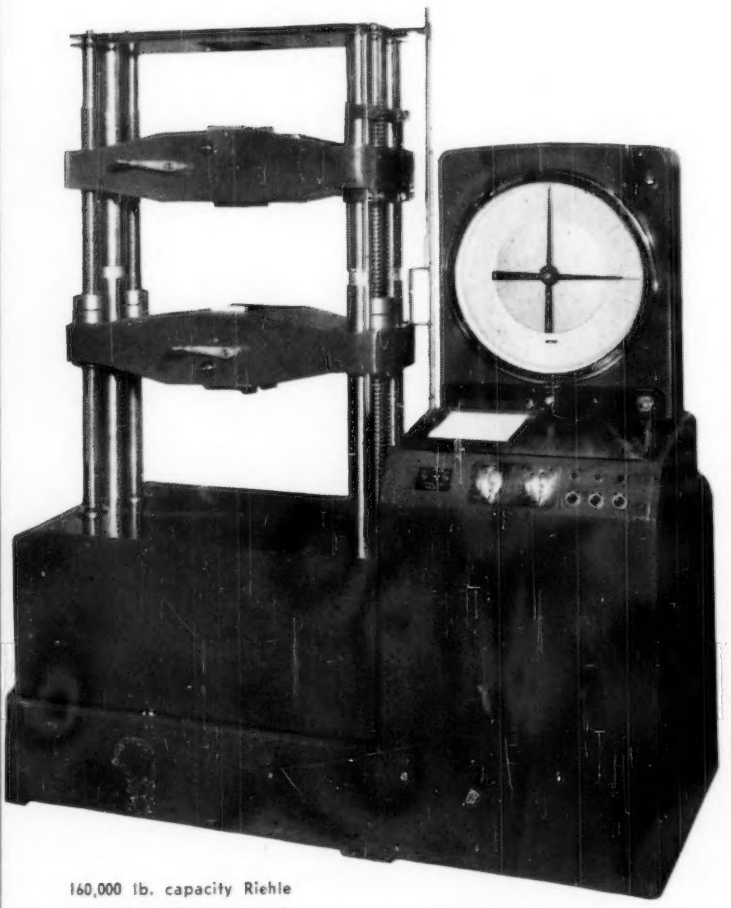

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"ONE TEST IS WORTH A THOUSAND EXPERT OPINIONS"

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ASTM BULLETIN

"Promotion of Knowledge of Materials of Engineering, and Standardization of Specifications and Methods of Testing"

TELEPHONE—Rittenhouse 6-5315 R. E. Hess, Editor R. J. Painter, Associate Editor CABLE ADDRESS—TESTING, Philadelphia

Number 183 JULY, 1952

50th Anniversary Meeting Outstanding; Record Breaking Registration; Number of Technical Papers, Exhibits

American and Foreign Delegates Present Tributes

THE combination of some 40 technical sessions, including certain informal round tables, about 450 technical committee meetings, and the Society's largest exhibit of testing apparatus and laboratory supplies, provided an extremely busy week for the record breaking number of members, committee members, and visitors who registered at the meeting. Including the official registration of 2606 and large number of exhibit visitors and those in attendance at the sessions, it is probable that upward of 5000 participated in the week-long 50th Anniversary Meeting. In the material which follows there are given in condensed form news accounts of most of the technical symposiums and special sessions, highlights of technical committee activities, and information on new officers, award winners, and other pertinent features.

Supplementing this material will be the usual Summary of Proceedings to be mailed to each member of the Society within the next few weeks. This Summary gives actions on standards and tentatives and, together with the preprinted reports of the technical committees, gives full information on the technical business transacted at the meeting.

New President

H. L. Maxwell

New Officers

Results of the letter ballot on election of new officers were announced at the President's Luncheon Session by the Chairman of the Tellers' Committee, Sherman R. Doner. The newly elected members of the Board of Directors were introduced, as was the new President, H. L. Maxwell, E. I. du Pont de Nemours & Co., Inc., and the new Vice-President, N. L. Mochel, Westinghouse Electric Corp. Photographs of the new officers and biographical material appear elsewhere in this BULLETIN.

Many New and Revised Standards

Although the increasing number of actions on standards referred to the Committee on Standards throughout the year, as covered in the various issues of the BULLETIN, have lightened the load at the Annual Meeting involving actions on standards, it is nevertheless significant that 68 new tentatives which essentially represent new work were approved for publication and, as noted in the accompanying summary of actions, there were over 250 current tentatives and standards in which revisions are to be made. Some of the activity reflects the desire of the technical committees to have their specifications and tests as up-to-date as possible for inclusion in the 1952 Book of Standards which is to be issued late this year. With this book published on a triennial basis, every effort is made to have the material going into it as up-to-date as possible.

List of New and Revised Tentatives:

In a separate article in this BULLETIN there is a complete list of the new and extensively revised tentative specifications and tests. Many members are interested especially in the serial designations that have been assigned.

Standards Published:

All of the new and revised tentatives and standards on which actions were taken at the meeting will be published in the big 1952 complete Book. In the meantime, many of the specifications and tests will appear in the special compilations of standards on which work is under way. Many of these compilations, for example, those of petroleum, textiles, and others, will be issued in the Fall, and a determined effort is made to issue separates of the standards as soon as possible. All of the new tentatives were preprinted in the respective committee reports, and it is presumed the members particularly

New Vice-President

N. L. Mochel

REGISTRATION—ANNUAL MEETINGS.

	Year	Members	Committee Members	Visitors	Total	Ladies
New York	1944	1185	368	510	2063	30 to 40
Buffalo	1946	978	405	452	1835	About 100
Atlantic City	1947	1071	469	246	1786	320
Detroit	1948	1160	358	250	1768	133
Atlantic City	1949	1092	530	235	1857	335
Atlantic City	1950	1160	637	334	2131	408
Atlantic City	1951	1220	660	402	2282	393
New York	1952	1375	674	557	2606	280

interested have requested copies of these reports.

Record Attendance

The extensive technical program with its large number of symposiums and special sessions together with committee meetings and the exhibit unquestionably helped in achieving a new high in registered attendance. From the accompanying table it will be seen that this year's figure of 2606 compares with 2277 for 1951 and 2131 of two years ago.

This year the New York Committee on Arrangements through its subgroup on promotion had publicized widely many of the meeting features and this brought to the meeting, particularly to some of the sessions and the exhibit, a large number of visitors, many of whom are not included in the official registration of the meeting. All of the technical sessions were well attended.

Too much credit cannot be given the New York Committee on Arrangements for the outstanding success of many features of the meeting. Every project sponsored by this group, the dinner, entertainment features, including the ladies' program, the laboratory visits, publicity and promotion, finances, and others were outstanding and contributed in large measure to the success of the meeting. The officers and subcommittee chairmen of the New York group have received many compliments on their work, and the Executive Committee adopted a formal resolution published in this BULLETIN expressing on behalf of the Society appreciation for their loyal and efficient work.

Special Local Features

THE New York Committee on Arrangements did everything possible to provide interesting features for the members and their families who were at the Meeting. The some 280 ladies who registered enjoyed one of the finest entertainment programs, and many favorable comments were tendered the committee for its hard but very productive work. At the special tea and at an interesting breakfast and a special luncheon there were demonstrations, talks, and shows designed to appeal to the ladies. There was a special sightseeing tour around Manhattan; many of them attended the President's Luncheon and the Annual Dinner, and many of the ladies enjoyed the hospitality lounge in the air-conditioned Statler Hotel Ballroom reserved for them. The large number of TV and radio tickets procured apparently were much appreciated, and they were all distributed. All of these features, excepting the dinner and luncheon, were complimented by the New York Committee.

The 50th Anniversary Dinner sponsored by the New York group, included an outstanding address by Dr. Detlev W. Bronk, President, National Academy of Sciences and also President, The Johns Hopkins University. In an interlude between dancing there was an excellent program of professional entertainment. The New York group had scheduled the cocktail party and dinner in the New Yorker's air-conditioned Ballroom and Foyers, fortunate foresight since the New York weather that night was almost at its hottest.

A most interesting group of laboratory visits were available to those members desiring to make such trips and full information was given in a special folder. Many members took advantage of special facilities in some of the outstanding laboratories in the New York area.

One of the finest photographic exhibits was developed and arranged by the New York group with the close cooperation of Committee E-4 on Metallography.

An innovation this year was an Information Center at the Meeting manned by New York members and associates. Thus, members could locate any special messages, obtain full information on New York and its environs, and get details of the meetings. Underlying all of the features was the work of the Committee on Promotion and Publicity which handled special projects, including a featured poster, a special symbol and slogan, and newspaper contacts among others. All of the features sponsored by the New York group were based on a strong financial program successfully carried through with the help of a dozen or more ASTM members who made contacts for the Finance Committee in specific industries. The response from the members and the member companies has been very gratifying, permitting a complete underwriting of all costs.

50th Anniversary Luncheon

Features of the 50th Anniversary Luncheon are presented in various portions of this BULLETIN, including the President's Annual Address "Some Gratifying Results" (p. 59), the address by Dr. R. E. Zimmerman, "Technical Minds Meet" (p. 33), excerpts from Dr. Caquot's remarks (p. 32), data on the Awards of Merit (p. 14), the Tribute to the late Executive Secretary C. L. Warwick (p. 17), and American and foreign delegates (p. 17).

Dr. Bronk Stresses Role for Engineer

AMONG the points stressed by Dr. Bronk in his interesting address at the dinner which included high praise for the Society for its technical accomplishments in its fifty years of service, was the fact that scientists and engineers must help to build our military strength and at the same time carry on their vital part in bolstering our economy. He emphasized the importance of understanding the needs of humanity, and in all of this work, human satisfaction must have an increasingly important part.

He said that we must continue to intensify our search for basic information because the future of technology and of our way of life depends upon having an adequate fund of basic data.

Engineers must give increasing thought to the conservation of our natural resources, particularly our irreplaceable ones, and should use more of our replaceable materials. In his training and early work, Dr. Bronk was concerned with human needs, and he stressed that the biological requirements of people who must operate machines must receive fuller consideration.

This BULLETIN gives Staff notes on the meetings, technical sessions, and symposiums; it also covers highlights of the technical committee meetings and actions. With information on new officers, award winners, and the President's address, it provides broad coverage of ASTM work. Extra copies of this BULLETIN are available without charge to members who would like to put a copy in the hands of friends or associates.

Outstanding Marburg Lecture on Non-Destructive Testing by Dr. McMaster

THE subject of this year's Marburg Lecture, the 26th in the series, nondestructive testing, is of wide interest. If no other evidence were available, the jam-packed lecture room at the Statler to hear Dr. McMaster, of Battelle Memorial Institute, would suffice. He presented the lecture in his usual forceful style and held the interest of the audience throughout. Since the lecture is to be published in the *Proceedings* and also separately, no attempt is made here to present an abstract. Dr. McMaster emphasized the growing significance of this system of evaluating materials, referring to its tremendous significance in World War II when not only the science of industrial radiography, but the other nondestructive tests such as magnetic particle, ultrasonic, magnetic analysis, and others were used intensively to provide the armed services with sound materials and components. He outlined the significance of nondestructive testing, described briefly the various methods that are available, and noted some of the economies of the picture.

This lecture added strength further to the prestige of the Society in establishing a firm understanding of the how and why of nondestructive testing. Through Committee E-7 on Non-Destructive Testing ASTM already has contributed immensely to technical progress in this field and also toward appreciation on the part of management of significance and applicability of these tests. Dr. McMaster's lecture was profusely illustrated as will be his published version to be issued later in the year.

Attending the presentation of the first Gillett Memorial Lecture was the family of the late H. W. Gillett, from left to right: Edward P. Gillett, Mrs. Gillett, Miss Guertha Gillett, and H. W. Gillett, Jr.

First Gillett Memorial Lecture

A MOST interesting Gillett Memorial Lecture—the first in this series which will be a feature of the meetings each year—was given by Norman L. Mochel, Manager, Metallurgical Engineering, Westinghouse Electric Corp., on the subject "Man, Metals and Power." Because this was the first lecture to commemorate the late Dr. Gillett, Mr. Mochel devoted a considerable portion to biographical material covering many of Dr. Gillett's chief interests, both technical and personal. Mr. Mochel said: "We enjoyed his striking personality,

Officers of New York Committee on Arrangements (Group Photograph) l. to r.: Ephraim Freedman (Publicity); G. R. Gohn (Technical Program); H. C. R. Carlson (Dinner); J. R. Townsend (General Chairman); Sam Tour (Entertainment); L. T. Work (Laboratory Visits); Jerome Strauss (Treasurer); Myron Park Davis (Photographic); G. O. Hiers (Secretary). Inset: F. M. Farmer (Honorary Chairman); L. C. Beard, Jr. (Non-Technical Program); K. G. Mackenzie (Finance); E. P. Pitman (Information); Gordon Thompson (Exhibit). Missing is W. B. Anderson (Assistant Secretary).

his keen interest, and we profited by his calm judgment and friendly advice. We have missed these in recent years; we do well to try to recapture these in spirit and memory."

In referring to Dr. Gillett as a maker of "men and metals," the lecturer noted that many terms of affection had been used. Probably he merited, because of his technical standing and his personality, to be included in that select group of "Deans of American Metallurgists" with Messrs. Howe, Sauveur, Campbell, and Bassett. As Chief of the Division of Metallurgy at the National Bureau of Standards Dr. Gillett participated in a veritable renaissance in metallurgy. Both at the Bureau and later when he became Director of Battelle Memorial Institute, the cosponsor of this series of lectures, he attracted many men to participate in the work. He was patient with young engineers. His doors were always open, and many went there regularly.

Some idea of his contributions may be had from a list of his writings, including several books, some 174 papers, 3 near-books, and 13 patents.

Manufactured Power:

Since the Gillett lecture deals with the development, testing, evaluation or application of metals, in all of which Dr. Gillett was active, Mr. Mochel in the technical portion of his lecture outlined the application of metals in the field of manufactured power. He said: "Manufactured power is a part of our very existence, and of our survival. It is the matter of great promise for the years of peace; it is the necessary bulwark in time of preparedness and conflict.'"

In noting the widespread use of ASTM standards and other ASTM work in the field of power development, he also pointed out that the first real central station turbine, a 1500-kw unit at Hartford, was in operation when ASTM was started in 1902. He showed many illustrations of power plants and parts showing the application of metals and other materials. He cited some of the metallurgical developments making possible the present high efficiency; for example, steels which without liquid quenching have yield strengths of 100,000 psi, with appropriate high temperature properties.

Looking toward the future and the possibility of a 300,000-kw unit, he listed some of the progress made; for example, a temperature increase of about 12 F per year; and a 1954 unit will require but 18 lb of structural steel per kw, whereas in 1945, 40 lb was needed. Many other significant facts were given, together with pertinent illustrations, all of which will be included in the final printed lecture to be available later in the year. This is to be issued in separate pamphlet form, and will also be included in the Annual *Proceedings*.

In conclusion, Mr. Mochel noted:

"Yes, it would appear that the metal needs in the field of manufactured power will be great in the years ahead. There will be need for new development, for testing, for evaluation of our metals. There will be need for new ASTM specifi-

Appreciation

From the Minutes of the June 22, 1952, meeting of the Board of Directors:

"The Executive Committee is cognizant of the very considerable amount of effort that has been put forth by the New York Committee on Arrangements for the 1952 Annual Meeting and the following resolution is recorded in the minutes in recognition of these efforts: "RESOLVED, that the Executive Committee, on behalf of the Board of Directors, records its appreciation of the contribution of the New York Committee and the many members and individuals who assisted it in making the comprehensive arrangements for the 1952 Annual Meeting. They gave unstintingly of their time and abilities to insure that the various aspects of the meeting were carried on successfully."

Gillette Lecture Group. ***From l. to r.:*** **R. L. Templin, T. S. Fuller, N. L. Mochel, and C. E. Williams.**

SUMMARY OF ACTIONS TAKEN AT ANNUAL MEETING AFFECTING STANDARDS AND TENTATIVES

	Existing Tentatives Adopted as Standard	Standards in Which Revisions Will Be Adopted	New Tentatives	Revisions of Standard and Reversion to Tentative	Tentative Revisions of Standards	Existing Tentatives Revised	Standards and Tentatives Withdrawn
A. Ferrous Metals—Steel, Cast Iron, Wrought Iron, Alloys, etc.	5	4	7	0	0	36	0
B. Non-Ferrous Metals—Copper, Zinc, Lead, Aluminum, Alloys, etc.	23	52	16	3	1	33	1
C. Cement, Lime, Gypsum, Concrete and Clay Products	18	11	9	6	4	13	1
D. Paints, Petroleum Products, Bituminous Materials, Paper, Textiles, Plastics, Rubber, Soap, Water, etc.	40	47	35	3	5	57	10
E. Miscellaneous Subjects, Testing, etc.	3	2	1	0	0	1	0
Total	89	116	68	12	10	140	12

cations and methods. We will not run out of work for this important application. And should the gas turbine or the atomic power developments make serious inroads on the steam turbine, the material problems are apt to increase the needs and problems from a metallurgical standpoint."

The Gillett lecture session was made the more interesting by the presence of Dr. Gillett's family, shown in the accompanying picture.

President Fuller introduced the Lecture Committee Chairman, Past-President R. L. Templin, who outlined the purposes of the lecture and then presented Dr. Clyde E. Williams, Battelle Director, who introduced Mr. Mochel and paid tribute to Mr. Mochel's work.

Sessions Notes

Symposium on Tin

TIN is the only major metal not covered by ASTM specifications. Committee B-2 on Non-Ferrous Metals and Alloys has been asked to look into the feasibility and desirability of preparing specifications for this metal. The first step in this direction was the arrangement for a Symposium on Tin to obtain actual information concerning such problems as tin resources, production capabilities, conservation measures, fields of usage, and problems of analyses.

The all-day session was opened with brief remarks by the Chairman of Committee B-2, Bruce W. Gonser. The papers covered many phases of the current tin situation beginning with a paper by F. Stuart Miller of the Pacific Tin Co. on "Tin Production and Resources," which pointed out that over 60 per cent of the world's tin continues to come from Malaya, Indonesia, Thailand, and Burma and that at the present rate of consumption there will be ample supplies of tin available for a number of years to come provided that political conditions are sufficiently stable for tin mining to be feasible.

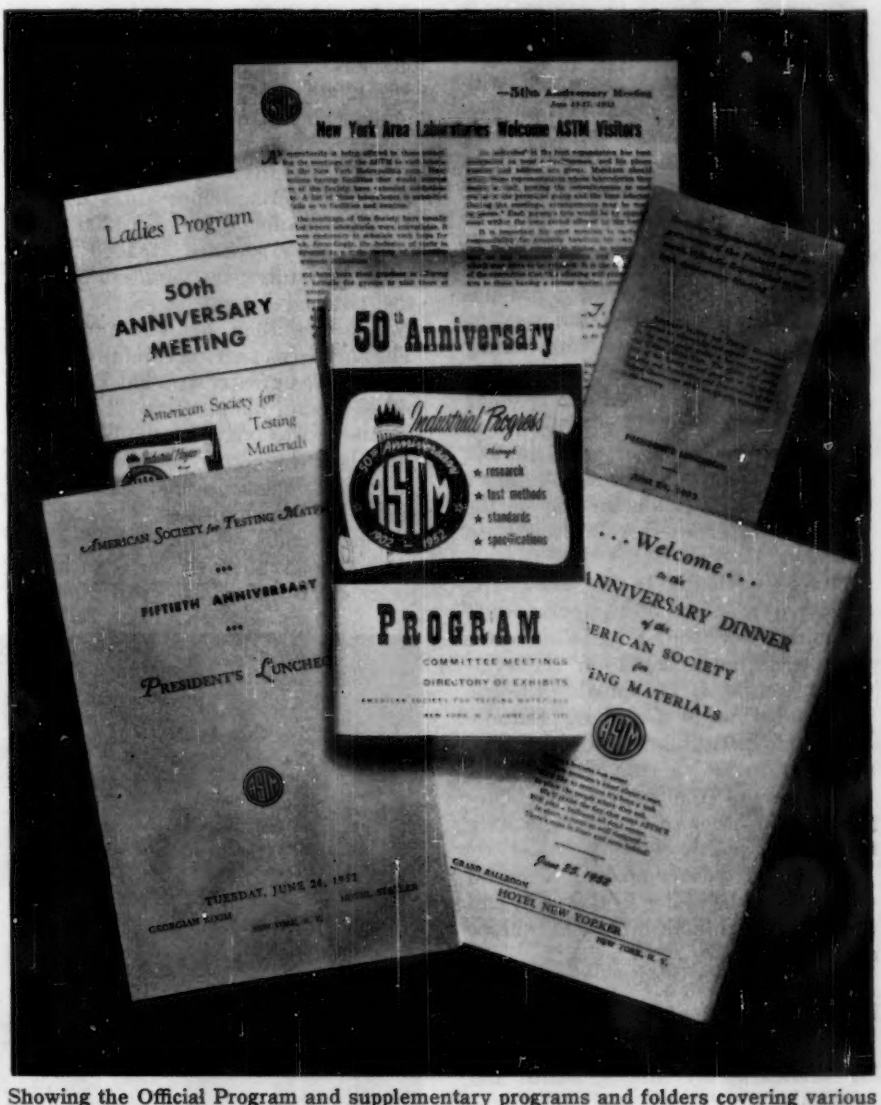
The usefulness of tin coatings in industry was surveyed and the methods of application reviewed by F. A. Lowenheim of the Metal & Thermit Corp. in his paper on "Tin Coatings." He dwelt particularly upon electroplating methods and the influence of tin purity upon coating application.

Although tin plate is unique as a container material for moist food products, circumstances have produced a long-term downward trend in its consumption per unit of tin mill products. This trend toward lower tin coatings has not yet ended as was apparent from a paper on "Trends in the Use of Tin in the Container Industry," by R. R. Hartwell, American Can Co.

Homer Pratt, General Motors Corp., presented a comprehensive analysis of the use of solders in his paper on "Solders in the Automotive Industry."

F. J. Dunkerly, University of Pennsylvania, in "The Effect of Impurities on the Performance of Tin," reviewed the literature in an attempt to correlate information on the effect of single impurities and some impurity combinations on the behavior of tin in many of its applications. This correlated review may form the basis for additional work on determining the effects of impurities on tin behavior.

Marie Farnsworth presented the paper, "The Determination of Small Amounts of Impurities in Tin," co-authored with Joseph Pekola, Metal and Thermit Corp. The authors pointed out that the improvement in quality of pig tin has necessitated improvement in analytical methods used for its control. In 1919, quality of grade 1 tin was listed as 99.86 per cent; in 1952, tin of 99.97 and 99.98 per cent purity is available commercially. Refined tin of even higher quality is available in limited quantity. The symposium concluded with a panel discussion on analysis of tin which was prepared and presented in cooperation with Committees E-2 on Emission



Showing the Official Program and supplementary programs and folders covering various features of the 50th Anniversary Meeting. The symbol developed by the New York Committee on Arrangements is shown on the main program and the Ladies Program. The President's Luncheon program included detailed citations for those receiving Awards of Merit which made it possible to give very brief citations at the ceremony. The list of society organizations and departments of the Federal Government officially represented at the meeting was an imposing one, upward of 150 organizations being listed with their delegates. The Laboratory Visits brochure was a distinct innovation—the committee included pertinent information covering interesting facilities, location, and contact representatives of some 40 laboratories in the New York Area which cooperated in the laboratory visits project. Many spoke about the pleasing appearance of the ladies' printed program and many compliments were received by the committee on the outstanding events enjoyed by the ladies, and in fact on all of the activities sponsored by the local committee.

Spectroscopy and E-3 on Chemical Analysis of Metals.

The papers were well received by the more than 125 members and visitors in attendance and the Society is planning to publish this symposium as a Special Technical Publication to be made available early in 1953.

Symposium on Effects of Notches and Metallurgical Changes on Metals at Elevated Temperatures

A THREE-session symposium covering the effects of notches and metallurgical changes on strength and ductility of metals at elevated temperatures, sponsored by the Joint Committee on Effect of Temperature on the Properties of Metals, was of outstanding interest at the meeting—particularly to those concerned with the many problems involved in supplying materials and designing and using them at the increasing higher temperatures desired by the operator to improve the efficiency of his equipment. The metallurgist is hard put to furnish metals with the desired high-temperature properties, but in part through symposiums of this kind, providing information from many sources and contributing to a free exchange of the valuable data that are being developed, he is doing a magnificent job. The interest in this symposium and the large number of papers testify to the metallurgist's desire to make maximum use of the inherent properties in a wide variety of alloys.

George V. Smith, U. S. Steel Corp., acted as chairman of the symposium committee for the Joint Committee and merits much credit for the symposium, as do J. D. Lubahn Electric Co., and Howard C. Cross, Battelle Memorial Institute, who did yeoman work in reviewing the manuscripts. A number of the papers were preprinted; in other cases abstracts were available.

It is expected the complete symposium will be published later in the year, and members and others interested will be advised.

Notes on the Papers:

All told there were 14 papers, including summaries by Messrs. Smith and Lubahn.

Although references were made in various papers to failures, Dr. Claude L. Clark, Timken Roller Bearing Co., noted in his discussion that a great many alloy steels have a commendable record of service life up to 100,000 hr or more.

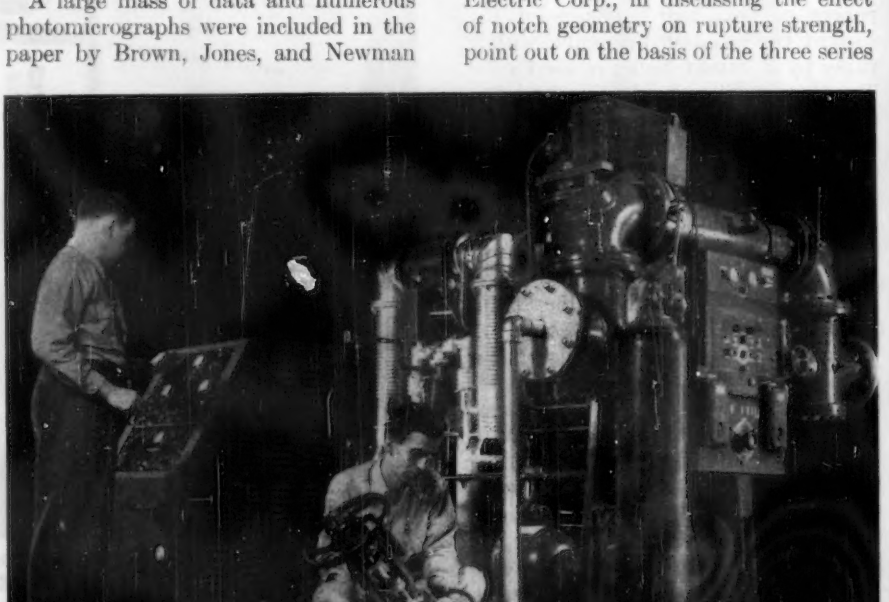
Messrs. Hull, Hann, and Scott, of Westinghouse, reviewed the effects of notch and hardness on the rupture strength of "Discaloy." This alloy, an Fe-Ni-Cr-Mo-Ti austenitic one, has valuable inherent properties, and the paper covers the behavior of the material with varying amounts of titanium, the hardener, in the presence of notches. Creep-rupture and notched bar rupture tests were conducted at 1000 and 1200 F. The plain bar rupture strength reached a maximum at a hardener content producing 2 per cent rupture strain, and the notched bar strength exceeded the plain bar strength in material in which the creep specimen had more than 5 per cent rupture strain.

The effect of grain size and notching upon the fatigue properties of Alloy X-40, AMS 5382, or Stellite No. 31 were covered by P. R. Toolin, of Westinghouse. Temperatures involved were 80, 1200, and 1600 F. The average unnotched fatigue strength of the low-pouring-temperature material, fine grained, is appreciably superior to that of the high-pouring-temperature material at room temperature and 1200 F but only slightly superior at 1600 F. At all temperatures, the variation between the notched fatigue strengths of the two is less than for the unnotched. The notch sensitivity of carefully ground notches was greater at 1200 F than at either room temperature of 1600 F, where it was very small. Machined notches have higher fatigue strengths at room temperature and 1200 F than carefully ground notches.

A large mass of data and numerous photomicrographs were included in the paper by Brown, Jones, and Newman of the National Advisory Committee on Aeronautics, dealing with the effect of sharp notches on stress rupture properties of several heat-resistant alloys. While all alloys tested were subject to notch weakening, there was considerable variation depending upon the alloy composition and treatment. The authors, from their work on unnotched specimens, indicated it would be difficult to set up a limiting value of ductility in unnotched specimens which would insure freedom from notch sensitivity under creep loading.

D. M. Frey, of Ford Motor Co., discussing the theory of rupture, noted that time-dependent rupture has been shown to be reasonably considered as two types of processes. At short times and high stresses, rupture is flow-induced. That is, dislocations that are put in motion and then stopped by various types of barriers, condense and form a microcrack of critical size, which can grow by Griffith theory. At long times and low stresses where creep is negligible, rupture is of a truly brittle nature. Here microcracks initially present in the lattice have enough time to grow by random thermal oscillations to critical size.

There has been a great deal of discussion on the size and nature of notches in determining impact and other properties, and while that in the tensile field is largely short-time tests, Messrs. Davis and Manjoine, Westinghouse Electric Corp., in discussing the effect of notch geometry on rupture strength, point out on the basis of the three series



Measuring Vacuum Tightness of Valve by Helium
First prize, General Photographs, in the Eighth ASTM Photographic Exhibit, by William W. C. Wilke, Jr., Crane Co.

of creep rupture tests which they carried out on several heat-resistant alloys that for metals with 10 per cent or less unnotched elongation the notch effect may be strengthening or weakening depending on the notch sharpness. The notch sensitivity increases with sharpness of the notch above a certain sharpness and this particular sharpness increases with ductility. Metals with the same ductility do not necessarily have the same notch sensitivity. For the same unnotched ductility or hardness, the notch sensitivity of an alloy increases with increasing grain size.

J. Glen, Metallurgist, Colvilles, Ltd., Scotland, described experimental studies of strength and ductility, particularly the effect of various tempering treatments on creep resistance of carbon and low-alloy steels. He was concerned with the effect of precipitation hardening, since creep tests and tension tests carried out over a range of temperature showed that an increase or decrease in resistance to deformation could be brought about by different tempering treatments.

To follow up these preliminary tests stress-strain tension tests were carried out on a series of low-carbon steels containing various amounts of manganese and molybdenum. Similar steels killed with aluminum were also tested. In the absence of manganese and molybdenum a maximum in the stress for a given strain was obtained at about 200 C. When manganese was added a second maximum appeared at about 300 C, and with molybdenum at about 500 C. These maxima in stress are attributed to the precipitation of carbides during the process of straining, the type of carbide formed depending on the testing temperature and the alloying elements present. The influence of tempering is also indicated.

To each maximum in stress there corresponds a minimum in ductility suggesting that the strain preceding rupture is also related to the precipitation of carbides, in this case at the grain boundaries.

Messrs. G. V. Smith and E. J. Dulles of the Research Laboratory, U. S. Steel Co., reviewed some of the problems in evaluating changes in metallurgical structure during service at elevated temperatures, for example the time-dependent feature. The major portion of the paper, however, evaluates the effect of sigma on the strength and ductility of 25 Cr, 20 Ni steel. Considerable data supplemented by interesting photomicrographs led to the authors' succinct conclusion—sigma in 25 Cr, 20 Ni austenitic stainless steel causes moderate strengthening at room temperature, severe loss in toughness even at temperature as high as 500 F, and moderate loss of creep rupture strength at 1300 F.

An interesting discussion of recovery and creep in an alloy steel was presented by Messrs. Lequear and Lubahn, General Electric Research Laboratory, with much supporting data. They note that "by interrupting a creep test and observing that the creep rate is higher afterward than before by amounts increasing with the duration of the interruption, it is possible to establish that recovery (reduction of the amount of strain hardening) has occurred. Recovery occurs in quenched-and-tempered chromium-molybdenum-vanadium steel at 1000 F, but not at 800 F.

When recovery occurs, the plastic creep rate becomes constant—sooner for smaller stresses, and apparently immediately for a sufficiently small stress. When recovery does not occur, the plastic creep rate decreases continuously. Recovery does not cause the creep, however, for pronounced creep occurs at temperatures where no recovery occurs.

Presented at the Symposium, although not a part of it, was a pertinent report from one of the Joint Committee Panels in the form of a technical paper by D. Preston, General Electric Co., covering investigation of high-temperature sheet materials. Some conclusions follow: It should be noted that tests were confined to one typical analysis of each alloy so that heat-to-heat variations are not considered.

The room temperature properties of strain-hardened alloys 19-9-DL H.S. No. 88, and Timken 16-25-6 do not indicate satisfactory formability.

The high-temperature strength of alloy H.S. No. 88 in creep and stress rupture is exceptionally high in view of its relatively low alloy content.

At 1200 F and 1350 F the creep strength of Discalloy 24 is appreciably higher than the other precipitation-hardened alloys studied.

On the basis of short-time strength, there is no advantage in using the cobalt-base alloys investigated at temperatures of 1500 F or less.

Session on Corrosion and Creep of Metals

THE strong interest in the Session on Corrosion and Creep of Metals was evident in the extensive discussion of many of the papers. The technical papers were preceded by the annual reports of Committee A-3 on Cast Iron, Committee A-5 on Corrosion of Iron and Steel, and Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys.

M. A. Cordovi, Babcock and Wilcox Co., in his paper "A Method of Evaluating Corrosion Test Results," presented details of a new type of sample and test procedure suggested for use in determination of corrosion by bismuth-base liquid metals. This method was developed and used at the Brookhaven National Laboratory.

Data from 15-year exposure tests of galvanized and stainless steel wires were summarized, analyzed, and condensed by A. P. Jahn, Bell Telephone Laboratories, in his paper, "Atmospheric Corrosion of Steel Wires."

A. J. Opinsky presented the paper coauthored with R. F. Thomson and A. L. Boegehold on "The General Motors Research Corrosion Test: A Cyclic Humidity Accelerated Corrosion Test for Sheet Steel." The authors presented results obtained in the use of a new corrosion test involving a slow humidity cycle, elevated temperature, and a superimposed dip of a weak electrolyte.

The results of a 9-year exposure of 71 alloy steels exposed to industrial, and marine atmospheres were presented by H. R. Copson, International Nickel Co. His paper "Atmospheric Corrosion of Low Alloy Steels," included weight loss, pit depth, thickness measurements, calculated pitting factors, and weight of rust.

J. D. Lubahn, General Electric Co., reported preliminary results indicating that creep curves can be calculated from a tension curve and from the rate sensitivity—rate sensitivity being determined by suddenly changing the tension testing rate and measuring the stress change. His paper, "Creep Tensile Relations at Low Temperatures," was based on the use of 61S-T aluminum.

The intermittent overloads encountered in the operation of jet aircraft create certain problems of predicting the life expectancy of structural materials exposed to high-temperature service. G. J. Guarnieri and L. A. Yerkovich, Cornell Aeronautical Laboratory, Inc., gave data obtained in connection with this study in conventional design chart form with coordinates of normal stress *versus* time for various amounts of deformation and rupture.

Session on Non-Ferrous Metals

SIX papers plus the Report of Committee B-5 on Copper and Copper Alloys, Wrought and Cast, were included in this session. F. M. Howell presented the paper by John E. Dorn and O. D. Sherby, University of California, on "The Creep Properties of Sand-Cast Aluminum Materials 319-T71, 319F and 356-T7." Results were presented of creep and stress-rupture properties under the range of tempera-

(*Continued on page 20*)

G. R. Gohn

W. H. Lutz

H. K. Nason

A. O. Schaefer

M. A. Swayze

New ASTM Officers

THE election of officers was announced at the Annual Meeting as follows: *President:* H. L. Maxwell (1952–1953), *Vice-President:* Norman L. Mochel (1952–1954), and five *Directors:* George R. Gohn, William H. Lutz, Howard K. Nason, Adolph O. Schaefer, and Myron A. Swayze (1952–1955).

President

HAROLD LEE MAXWELL, Supervisor of Mechanical Engineering Consultants, E. I. du Pont de Nemours & Co., Inc., was born in Cottage Hill, Iowa, and graduated from Cornell College in that state with a B.S. degree in chemistry. He received his doctorate from Iowa State College and was subsequently Associate Professor of Chemical Engineering at Purdue University from 1926 to 1930.

He joined du Pont in 1930 and during the following years organized three large metallurgical groups, that is, one research group and two plant service activities. He is at present Supervisor of some 60 engineering consultants in the du Pont Company, extending over the fields of (1) metallurgy, ceramics, and building materials, (2) materials handling and containers, (3) mechanical improvement, and (4) maintenance.

Associated with ASTM for many years, Dr. Maxwell has been a member of both technical and administrative committees. He was elected ASTM Vice-President in 1951 and is currently a member of the Finance Committee and Chairman of the Executive Committee.

During World War I, Dr. Maxwell served in the U. S. Army and in the recent war he served on the War Production Board Technical Advisory Committee concerned with materials for chemical equipment. He also participated in technical missions to Europe following the war. Widely known as an authority on metallurgy and engineering materials for constructing chemical manufacturing equipment, Dr. Maxwell has contributed numerous technical articles for publication here and abroad.

His other memberships include American Chemical Society, American Society for Metals, American Institute of Chemical Engineers, American Institute of Metallurgical Engineers, American Welding Society, Society for Experimental Stress Analysis, and British Iron and Steel Institute.

Vice-President

NORMAN L. MOCHEL, the new Vice-President, is Manager of Metallurgical Engineering, Westinghouse Electric Corp.

A native of Pittsburgh, Mr. Mochel was first employed in his home city in the Inspection Department of the then Westinghouse Machine Co. He became responsible for the work of testing materials with this company and has for many years held his present position.

Mr. Mochel has had a long and intensive record of service in ASTM. For a number of years he was chairman of Committee A-1 on Steel, one of the Society's largest committees, and was also chairman for several terms of the joint ASTM-ASME Committee on Effect of Temperature on Properties of Metals in which he is still very active. He is a member of the ASTM Ordnance Advisory Committee and represents his company on Committees A-10 on Iron-Chromium-Nickel and Related Alloys; E-7 on Non-Destructive Testing; and E-9 on Fatigue.

He has written numerous technical papers, one of which "The High-Temperature Fatigue Strength of Several Gas Turbine Alloys," co-authored with P. R. Toolin, won the 1948 ASTM Charles B. Dudley Medal for the outstanding paper on research in that year. This year he was selected to present the first Gillett Memorial Lecture.

During World War I, Mr. Mochel saw service overseas with the Engineers Corps and in World War II rendered invaluable service in a civilian capacity to several branches of the Government and Armed Forces. One of his outstanding contributions was to the National Emergency Steel Specifications work. Active in the National Advisory Committee on Aeronautics, he has for years cooperated closely with the U. S. Navy. His company honored him for outstanding work by one of its early Awards of Merit.

Among other organizations in which Mr. Mochel is active are the American Welding Society and the American Society for Metals. He has served his home community, Ridley Park, Pa., in various capacities, particularly in school board activities, including the treasurership.

Directors

George R. Gohn, Supervisor, Creep and Fatigue Laboratories of the Bell Telephone Laboratories, was born in Dayton, Ohio. He received his B.A. degree from Otterbein College, attended Ohio State University Graduate School, and received his B.S. in Engineering and his Metallurgical Engineer degree from Columbia University School of Mines.

Following a period with General Motors Research Laboratories, he was engaged for several years in general home construction. Mr. Gohn's association with Bell Telephone Laboratories began in 1929 when he became a member of the technical staff with intensive work in materials testing, die-casting, and specifications for non-ferrous metals. Prior to his present position he was supervisor of metallic materials, materials consultant on miscellaneous war projects during the recent war period, and engaged in metallurgical research.

Mr. Gohn has been a member of ASTM for many years and has served actively on its Technical Committees B-2 on Non-Ferrous Metals and Alloys; B-5 on Copper and Copper Alloys; B-6 on Die-Cast Metals and Alloys; B-7 on Light Metals and Alloys; E-1 on Methods of Testing; and E-9 on Fatigue. For the past seven years he has been a member of the Administrative Committee on Papers and Publications and recently served as chairman of the special committee in charge of the technical program for ASTM's Fiftieth Anniversary Meeting.

In addition to his extensive activities on behalf of the Society, Mr. Gohn is also a member of the American Institute of Mining and Metallurgical Engineers, the American Society for Metals, and has written numerous papers on properties and methods of test for non-ferrous metals.

Mr. Gohn makes his home in Port Washington, N. Y., and takes an active part in community affairs.

William H. Lutz, Technical Director, Pratt & Lambert, Inc., was born in Ilion, N. Y., and received his degree in Chemical Engineering from Rensselaer Polytechnic Institute.

Mr. Lutz's first contacts with ASTM were in the work of Committee D-9 on Electrical Insulating Materials when he was with General Electric Co., General Engineering Laboratory, Insulating Division. In 1927 he joined Pratt & Lambert as lacquer chemist, becoming Technical Director in 1936. During the second World War he served as a member of the Alkyd Resin Industry Advisory Committee of WPB.

Mr. Lutz has been an active member of ASTM for many years, participating in numerous phases of the work of Committee D-1 on Paint, Varnish, Lacquer and Related Products. He is a member of the Western New York-Ontario Research Council and the Administrative Committee on District Activities. He is also a Society representative on the Technical Coordinating Committee for the Paint Industry.

His other memberships include the American Chemical Society in which, as in ASTM, he has directed the development of various technical programs; the Federation of Paint and Varnish Production Clubs (he is a past-president of the Western New York Paint and Varnish Production Club); National Paint, Varnish, and Lacquer Assn.; and he is a Fellow of the American Institute of Chemists.

Howard K. Nason, Research Director, Organic Chemicals Division, Monsanto Chemical Co., was born in Kansas City, Mo. He attended Kansas City Junior College, Washington University, and received his degree from the University of Kansas in 1934.

From 1932 to 1936 he was chief chemist for Anderson-Stolz Corp. of Kansas City where he worked on industrial water treatment and protective coatings. In 1936 he joined Monsanto Chemical Co. as a research chemist, becoming assistant director of research for the Plastics Division in Springfield, Mass., where he did much of the pioneering work on the mechanical properties of plastics. He was later director of the Central Research Dept. in Dayton, Ohio, and in 1950 was made assistant to Monsanto's vice-president in charge of research, development, and patents. Appointment to his present position came in 1951.

Mr. Nason has been a member of ASTM for a number of years, serving on Committees D-1 on Paint, Varnish, Lacquer and Related Products; D-9 on Electrical Insulating Materials; D-14 on Adhesives; and D-20 on Plastics. From 1948 to 1951 he served a term on the Board of Directors. He is a member of the Administrative Committee on Papers and Publications, and the ASTM Ordnance Advisory Committee.

He has published numerous technical papers on industrial chemicals and plastics, and is the holder of several patents. In addition to ASTM he holds membership in the American Chemical Society, Society of Rheology, American Association for the Advancement of Science, New York Academy of Sciences, American Institute of Chemical Engineers, and the Chemists Club.

Adolph O. Schaefer, Vice-President in Charge of Engineering and Manufacturing, The Midvale Co., is a native of Philadelphia and received his degree in Chemical Engineering from the University of Pennsylvania in 1922.

Immediately upon graduation he became associated with The Midvale Co. as a research metallurgist and has subsequently held the positions of assistant production manager, engineer of tests, executive metallurgical engineer, executive engineer, and assistant to the executive vice-president. He was appointed to his present position in 1951.

Mr. Schaefer has been very active in ASTM, especially in Committee A-1 on Steel, where he has directed significant work as chairman of Subcommittee VI on Forgings and Billets. He represents his company on Committee A-10 on Iron-Chromium-Nickel and Related Alloys, and is on Committee E-7 on Non-Destructive testing. He has for many years participated in the activities of the Society's Philadelphia District, and is completing two terms as District Chairman.

His contributions to the recent war effort included work on the War Production Board and with the British Metallurgical Mission. Since 1945 Mr. Schaefer has been on the U. S. Metallurgical Advisory Committee for Guns. Memberships in other societies include American Society for Metals (past-chairman of the Philadelphia section and currently a nominee for National Trustee), American and British Iron and Steel Institutes, American Institute of Mining and Metallurgical Engineers, American Ordnance Assn., U. S. Naval Institute, Engineers Club and Chamber of Commerce of Philadelphia, and the Franklin Institute.

Myron A. Swayze, Director of Research, Lone Star Cement Corp., was born in Lima, N. Y., and was educated in the public schools of Cleveland, Ohio, graduating from Case Institute of Technology with a B.S. in Chemical Engineering and later the degree of Chemical Engineer.

Following the period 1912–1913 with the Crescent Portland Cement Co., he was with Texas Portland Cement 1913–1921, then Division Chief Chemist, Lone Star Cement Corp. 1921–1929, Assistant Chief Chemist for the Lone Star Cement System 1929–1932, and Division Chief Chemist and Research Engineer 1332–1934. He was made Director of Research in 1934. He attended the International Symposium on Cement Chemistry in Stockholm (1938) as Cement Industry representative, and on leaves of absence was Designing Engineer for a lithium plant under Singmaster and Breyer (1942) and made a survey of the German cement industry for F.E.A. in 1945.

Mr. Swayze has been a member of ASTM since 1925, serving actively on Committee C-1 on Cement, where he has headed various subcommittees and working groups. From 1939 to 1941 he was a member of the ASTM Board of Directors and also of the Executive Committee.

Among other organizations in which he holds membership are the Portland Cement Assn, the American Concrete Institute (being the 1942 recipient of the Wason Medal), and the Chemists' Club of New York.

Awards of Merit Conferred for Distinguished Service

AWARDS OF MERIT in recognition of distinguished service to the Society were conferred on ten members at the Luncheon Session of the Annual Meeting held on Tuesday, June 24. The men so honored were:

Wheeler P. Davey
George H. Harnden
Jay C. Harris
Jerome J. Kanter
H. S. Mattimore
Douglas E. Parsons
Hugh M. Robinson
John D. Sullivan
Ray Thomas
Fred D. Tuemmler

These Awards, in the form of special certificates, were presented to those present by President Fuller, following brief citations by Louis J. Trostel, Chairman of the Award of Merit Committee.

Under the rules of the Award of Merit, which was established by the Board of Directors in 1949, each technical committee may suggest one candidate annually. These suggestions, together with any from other areas of the Society's activities, are reviewed by the Award Committee and nominations made to the Board of Directors. Long-time service to ASTM, marked leadership and outstanding research and authorship, particularly in the fields of technical activity, are the chief criteria of selection.

The following citations indicate the spheres of activity and particular services rendered by each of the men who received this honor.

To **Wheeler P. Davey,** long-time Professor of Physics and Chemistry, The Pennsylvania State College, State College, Pa., and notable authority in the field of X-ray diffraction for significant leadership in the work on chemical analysis by X-ray diffraction methods, and the preparation and publication of X-ray diffraction data in a card index universally used. A pioneer investigator and experimenter responsible for many early designs in X-ray diffraction equipment, and author of many important papers and reports, Dr. Davey through official capacities in other organizations in this field, national and international, has furthered widespread interest in ASTM work in the fields of metallography and nondestructive testing. His intensive work in the Society has been concentrated in Committees E-4 on Metallography and E-7 on Non-

G. H. Harnden

W. P. Davey

J. C. Harris

J. J. Kanter

H. S. Mattimore

Destructive Testing, and in the Joint Committee (American Crystallographic Assn., British Institute of Physics, and ASTM) on Chemical Analysis by X-Ray Diffraction Methods. Much of the success of the Joint Committee work has been due to Dr. Davey's untiring efforts.

To **George H. Harnden,** Specifications Engineer, Standards Division, Executive Department, General Electric Co., Schenectady, N. Y., for notable services, especially in Committee B-5 on Copper and Copper Alloys, and also in other metals committees, and in the Administrative Committee on Standards. An active member of B-5 since 1936, and its chairman since 1945, Mr. Harnden has ably directed the group in the promulgation and revision of many important specifications reflecting great credit on the Society. Other metals groups where he has rendered valued assistance include A-1 on Steel, B-1 on Wires for Electrical Conductors, B-2 on Non-Ferrous Metals and Alloys, and B-7 on Light Metals and Alloys. He also has rendered diversified technical service in the following committees: D-2 on Petroleum Products and Lubricants, D-6 on Paper and Paper Products, where he served as secretary for eight years, D-13 on Textile Materials, and E-11 on Quality Control of Materials.

To **Jay C. Harris,** Assistant Director, Central Research Department, Monsanto Chemical Co., Dayton, Ohio, for outstanding service and constructive leadership, particularly in the field of soaps and other detergents, and for untiring work in preparing the Metal Cleaning Bibliographical Abstracts. Active in the work of Committee D-12 (on Soaps and Other Detergents) for the past 15 years, secretary of this group for four years, and now chairman, Mr. Harris through his direction and influence has contributed much in the attainment by Committee D-12 of its present standing as an important force in this field of industry. The presentation alone of the Metal Cleaning Abstracts dating from 1893 through 1950 has been of singular benefit to ASTM and to Committee D-12, and Mr. Harris recently has completed compilation of material for a 1951 Supplement. In addition to his technical activities, he has been a member of the Ohio Valley District since its organization and has headed the group as chairman since 1950, rendering loyal service in the duties of that office.

To **Jerome J. Kanter,** Directing Engineer, Engineering Laboratories, Crane Co, Chicago, Ill., recognizing consistent and constructive work in standards and research over many years, notably in Committee A-1 on Steel, but also in other ferrous and non-ferrous metals fields. Currently he is serving as Vice-Chairman of B-5 on Copper and Copper Alloys. In the Committee on Steel he has headed the groups concerned with castings and welding fittings for high-temperature and subatmospheric temperatures; also in the Joint ASTM-ASME Committee on Effect of Temperature on the Properties of Metals he serves as chairman of the test method panel and of the section studying the effect of manufacturing variables on the creep properties of steel. His leadership in these as well as other groups concerned with valves and fittings and his constructive service as secretary and chairman of the Chicago District Council over a combined eight-year period have been important contributions to the growth and welfare of the Society.

To **H. S. Mattimore,** Engineering Consultant, Colonial Park, Pa., for many years Engineer of Materials, Pennsylvania Department of Highways, for distinguished service in Committee D-4 on Road and Paving Materials, and in other technical committees where he has done important work in the development of specifications and test methods. A zealous member of D-4 for the past 36 years, Mr. Mattimore headed the main group for two years, and has served on numerous subcommittees. He has been a member of Committee C-1 on Cement since 1926, and has made valuable contributions also in Committees C-9 on Concrete and Concrete Agregates, C-13 on Concrete Pipe, and E-1 on Methods of Testing. His knowledge, developed by life-long studies, of the properties and uses of road-building materials has been of inestimable value in the development of activities in these several groups. Particularly in his capacity as an officer of the Committee on Materials of the American Association of State Highway Officials for 25 years he did much to extend the use of standard specifications and test methods by state highway departments.

To **Douglas E. Parsons,** Chief of Building Technology Division, National Bureau of Standards, Washington, D. C., for outstanding service over many years, especially in the technical fields of masonry constructions involving Com-

H. M. Robinson

D. E. Parsons

J. D. Sullivan

Ray Thomas

F. D. Tuemmler

mittees C-12 on Mortars for Unit Masonry and C-15 on Manufactured Masonry Units; and for service in ASTM administrative work. Chairman of Committee C-10 on Hollow Masonry Building Units and its successor, Committee C-15 from 1926 through 1948, and Chairman of the Committee on Asbestos-Cement Products for a term, and with membership on many other committees and subcommittees, some of which he headed, his record of service has been coupled with leadership, tact, and thorough technical knowledge, which are reflected in many of the accomplishments of these technical groups. His work and counsel on the Administrative Committees on Standards and on Simulated Service Testing have been of great value, as also are his continuing evaluations of technical papers and programs.

To **Hugh M. Robinson,** Service Engineer, Underwriters' Laboratories, Inc., Chicago, Ill., in recognition of faithful and efficient services and sustained contributions to the work of Committee E-5 on Fire Tests of Materials and Construction, and for significant service in his special field on other ASTM technical committees, including C-11 on Gypsum, C-15 on Manufactured Masonry Units, and D-7 on Wood. As the Secretary of Committee E-5 from 1938 to 1951, Chairman of its Subcommittee on Roof Coverings, and a member of six other subgroups, he had a large part in the research and in the standards issued by this committee which have attained widespread recognition. Through his work in other organizations involved with building code requirements and fire tests of materials he stimulated the knowledge and use of ASTM standards. He also had a period of service as a member of the Chicago District Council.

To **John D. Sullivan,** Assistant Director, Battelle Memorial Institute, Columbus, Ohio, for important contributions over many years, particularly in the work of Committee C-8 on Refractories which he headed for 12 years and where his authoritative knowledge of extractive metallurgy and applications of ceramic science, coupled with a realization of the importance of research and standardization in the refractories field, and the ability to stimulate active interest of his associates, have contributed in great measure to the extensive use of ASTM standards on refractories. Dr. Sullivan took a direct part in three editions of the widely distributed Manual on Refractory Materials. He also headed the committee's work on heat transfer and chemical analysis. Through his widespread activities in the work of other organizations he has stimulated broad interest in the Society's work in the field of ceramics.

To **Ray Thomas,** Staff Engineer, Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corp., South Charleston, W. Va., for inspiring leadership in standards and research work, notably in Committee C-16 on Thermal Insulating Materials. Affiliated with C-16 since its organization in 1938, Mr. Thomas served as chairman for four years, and rendered efficient and faithful service as secretary for a like period, contributing much to the progress of this group. Through his contacts and activities with other organizations in the field, for example his presidency of the Thermal Insulation Society, also his work with refrigerating engineers, and through his writing, Mr. Thomas has stimulated interest on the part of many others in ASTM work in the field of thermal insulation, and this has been important in promoting knowledge of the significance and use of standards.

To **Fred D. Tuemmler,** Head, Analytical Standardization Department, Shell Development Co, Emeryville, Calif., for significant and valued service, particularly in the work of Committee D-2 on Petroleum Products and Lubricants, and in the coordination of that work with other ASTM committees. Other groups with which he is actively affiliated include Committees D-3 on Gaseous Fuels, D-16 on Industrial Aromatic Hydrocarbons, E-1 on Methods of Testing, and E-11 on Quality Control of Materials. His work on improving the form of the standard methods of tests for petroleum and petroleum products, his extensive knowledge of methods of evaluating petroleum, coupled with his zeal, tenacity of purpose, and clarity of vision have contributed greatly to the science of testing, and have resulted in immense benefits to the Society.

Medalists and Award Winners

Charles B. Dudley Medal

THE Charles B. Dudley Medal, commemorating the Society's first President, is presented for a paper of outstanding merit constituting an original contribution on research in engineering materials.

1952 AWARD TO NORMAN W. MCLEOD

Norman W. McLeod, Asphalt Technologist, Imperial Oil Co. Ltd., was this year's medalist for his paper, "Application of Triaxial Testing to the Design of Bituminous Pavements," presented at the 1950 Annual Meeting.

N. W. McLeod

Mr. McLeod, formerly in charge of the testing laboratory, Saskatchewan Department of Highways and Transportation, has been associated with Imperial Oil since 1938. He has also served since 1945 as Engineering Consultant to the Department of Transport, Ottawa, Canada, in connection with a continuing investigation of airport runways. His award-winning paper resulted from one phase of this investigation. An earlier paper, "Airport Runway Evaluation in Canada," received the U. S. Highway Research Board Award for 1946.

A member of a number of technical societies, Mr. McLeod was President of the Association of Asphalt Paving Technologists in 1950–1951.

Richard L. Templin Award

The purpose of this award is to stimulate research in the development of testing methods and apparatus, to encourage the presentation to the Society of papers describing new and useful testing procedures and apparatus, and to recognize meritorious efforts of this kind.

1952 AWARD TO THOMAS J. DOLAN

This award was won by Thomas J. Dolan, Research Professor of Theoretical and Applied Mechanics, University of Illinois, for his paper, "Electrically Excited Resonant-Type Fatigue Testing Equipment," which was presented at the 1951 Annual Meeting.

Professor Dolan has been a member of the University of Illinois faculty since his graduation from that institution in 1929. He has done research on railway track, fatigue of metals, photoelastic stress analysis, properties of low-alloy steels and special aluminum alloys for airplane propellers. He is at present doing graduate teaching and research in properties of materials and is acting as Project Director of cooperative research programs for the armed forces.

In 1951 Professor Dolan participated in a special conference on fatigue of metals

T. J. Dolan

held in Stockholm at which he presented a paper on the "Research in Fatigue of Metals in the USA," which included a discussion of the activities of ASTM Committee E-9 on Fatigue.

He has been an active member of ASTM particularly in Committee E-9, is currently President of the Society for Experimental Stress Analysis, and has served on committees of the National Research Council and the Research and Development Board.

Sanford E. Thompson Award

The Sanford E. Thompson award is given for a paper of outstanding merit on concrete and concrete aggregates.

1952 Award to Harrison F. Gonnerman and William Lerch

Harrison F. Gonnerman, Assistant to the Vice-President in Charge of Research and Development, Portland Cement Assn., and William Lerch, Administrative Assistant, Research and Development Laboratories, Portland Cement Assn., were the authors of the winning paper, "Changes in Characteristics of Portland Cement as Exhibited by Laboratory Tests over the Period 1904 to 1950," which was presented at the 1951 Annual Meeting.

Mr. Gonnerman, an engineering graduate of the University of Illinois, was associated with that University as a faculty member and in the Engineering Experiment Station for a number of years prior to joining the Portland Cement Assn.

W. Lerch H. F. Gonnerman

An active member of ASTM Committee C-1 on Cement for more than 20 years, he has just completed a term as Director. He is a member of several other technical organizations and a Past-President of the American Concrete Institute, an organization in which he has been very active.

Mr. Lerch, whose 1947 paper, "The Influence of Gypsum on the Hydration and Properties of Portland Cement Pastes, won the Thompson Award in that year, is an active member of ASTM Committees C-1 on Cement, C-9 on Concrete and Concrete Aggregates, and C-7 on Lime. In this work his numerous papers on cement and concrete research have provided valuable information that has been used in the preparation of specifications.

Fifty-Year Members and individuals representing 50-year company members were recognized at the President's Luncheon. Those present at the Luncheon were left to right: J. C. Weaver representing the Sherwin-Williams Co.; William C. Du Comb; G. H. Clamer representing the Ajax Metal Division of H. Kramer and Co.; Paul Archibald representing Standard Steel Works Division, Baldwin-Lima-Hamilton Corp.; D. T. Rogers representing Jones & Laughlin Steel Corp.; J. G. Althouse representing Lukens Steel Co.; T. A. Benton, representing International Harvester Co. For complete list of 50-Year Members, see accompanying article.

Individual 40-Year Members and those representing 40-Year Company Members who attended the President's Luncheon, are, left to right: F. H. Baumann representing New Jersey State Highway Dept.; R. C. Corson representing Associated Factory Mutual Fire Insurance Cos.; G. G. Wiest representing Warner Co.; R. C. Stratton representing Travelers Insurance Cos.; A. C. Weber representing Laclede Steel Co.; S. R. Doner representing Raybestos-Manhattan, Inc.; A. W. Carpenter representing B. F. Goodrich Co.; Henry R. Gundlach. For complete list of 40-Year Members, see the accompanying article.

September 1—Last Day for Annual Meeting Papers Discussion

Written discussion of papers and reports presented at the Annual Meeting will be received by the Committee on Papers and Publications until September 1. In view of the fact that much of the discussion published in the *Proceedings* is submitted after the meeting by letter, it will be helpful if all who can will send in their discussion to Headquarters well in advance of this date so that additional time is available to review and refer the discussion to authors for closure.

50 and 40-Year Members

At the luncheon session of the Annual Meeting, held Tuesday, June 24, recognition was given to individuals and organizations holding continuous membership in the Society for 50 and 40 years.

Ten members who have been associated with the Society since its incorporation in 1902, and were eligible to receive 50-year membership certificates include:

Charles Derleth, Jr.
William C. Du Comb
Bradley Stoughton
Ajax Metal Division of H. Kramer and Co.
E. L. Conwell and Co.
International Harvester Co.
Jones & Laughlin Steel Corp.
Lukens Steel Co.
The Sherwin-Williams Co.
Standard Steel Works Division, Baldwin-Lima-Hamilton Corp.

Thirty-one members have completed this year 40 years of membership, bringing the total number of certificates issued to the "Forty-Year Club" to 215. Those receiving certificates in person at the luncheon or later by mail are:

Allegheny-Ludlum Steel Co.
Associated Factory Mutual Fire Insurance Cos.
James Aston
Birdsboro Steel Foundry and Machine Co.
Calumet Steel Div., Borg-Warner Corp.
D. J. Demorest
The B. F. Goodrich Co.
Henry R. Gundlach
Kansas State College of Agriculture and Applied Science Library
Kelley Island Lime and Transport Co.
J. B. Kommers
Laclede Steel Co.
Lloyd's Register of Shipping
John R. MacGregor
Kenneth Gerard Mackenzie
Ibrahim F. Morrison
National Lime Assn.
New Jersey State Highway Dept.

Niagara Mohawk Power Corp.
Ohio State University Library
Owen K. Parmiter
Patent Office Library (London)
Pioneer Service and Engineering Co.
F. B. Porter
Raybestos-Manhattan, Inc., Manhattan Rubber Div.
F. W. Smither
John F. Tinsley
Travelers Insurance Cos.
Union Steel Castings Div., Blaw-Knox Co.
Warner Co.
University of Wisconsin Library

Many American and Foreign Groups Extend Greetings to the Society

UPWARD of 150 technical and scientific societies, trade groups, and departments of the Federal Government designated official delegates to represent them at the Annual Meeting, specifically the President's Luncheon on June 24, at which these various groups were recognized. The printed list of delegates arranged the various bodies into the following groups: Federal Government, "Those from Across the Seas," and the American and Canadian societies. The list was an imposing one, indicating the breadth of interest on the part of government and industrial organizations concerned with our work.

Many cordial greetings and expressions of good will were received; in fact, the response to the Society's invitation to designate delegates, in itself, indicated the high regard in which ASTM is held.

There had been no intention to suggest scrolls or resolutions. A few of the foreign groups however did present these, and the one from Belgium was particularly interesting, since it was specially printed for the ASTM 50th Anniversary with old wood block type that dates back, apparently, to 1569, this type being on display at the Museum of Antwerp.

Tribute at President's Luncheon to Late Executive Secretary C. Laurence Warwick

One of the very moving occasions at the Annual Meeting occurred during the President's Luncheon, Tuesday, June 24, when those assembled paid tribute to the Society's late Executive Secretary. Following his remarks which appear below, Past-President L. J. Markwardt requested the large assemblage at the luncheon to rise and remain standing for a moment in silent tribute.

"We would be remiss if we did not pause a moment in our activities on this occasion to take note of our vacant chair and pay tribute to the memory of C. Laurence Warwick. The untimely passing of our efficient, capable, and friendly Executive Secretary has shocked us all. Mere words are inadequate to express our feelings.

"How often have you noted, as you review historically the many significant highlights of achievement and progress, the association of names that become symbolic of these achievements. So it was with C. Laurence Warwick and the ASTM—for he was, more than anyone else, Mr. ASTM.

A Cathedral built by skillful hands,
On Ludgate hill through centuries stands,
Still serving those who heed its call,
Tribute to Wren who planned it all.

So thus have men throughout the years
Rendered service in many spheres,
Pioneering in some worthy cause,
Exploring nature's basic laws.

A program launched and gaining stride
Challenged a youth, its course to guide;
Our Society this eventful year,
Bears tribute to his great career.

We view the structure finely wrought
From knowledge of materials sought;
But more than standards, oft revised,
Endured warm friendships that he prized.

—L. J. Markwardt

"And these ever-challenging words of Longfellow seem particularly appropriate at this time and on this occasion:

Lives of great men all remind us
We can make our lives sublime,
And departing leave behind us,
Footprints on the sands of time.

—Longfellow

"And as one reflects on the inspiration of leadership, there is fitting reminder of its significance in these words of Blumenthal:

What makes a nation's greatness, how can it be weighed
Upon the scales of history, how will it be assayed?
The truth shall be recorded by the every moving pen,
The measure of a nation is the stature of its men.

—S. Blumenthal

"C. Laurence Warwick will long live in our memory and in the history of our Society.

Paint Committee Observes Fiftieth Anniversary

COMMITTEE D-1 on Paint celebrated this year the Fiftieth Anniversary of its organization, having been organized the same year the Society received its charter. A session of the Annual Meeting was set aside for this observation, and at this meeting a number of papers were presented reviewing the work of the individual subcommittees since their organization. It was indeed interesting to note the study that had been put upon the various test procedures over the years. In many cases accord had been reached with respect to specific test methods, whereas in other instances the conclusion was reached that the particular method under consideration did not lend itself to standardization.

In further commemoration, the committee sponsored a dinner at which mention was made of the activities of the early members and the part they had played in getting the work of D-1 firmly established—individuals such as Sabin, Thompson, P. H. Walker, Harley, Nelson, and many others.

A number of organizations who held membership on the committee 50 years ago are still represented. The papers' session was organized by Mr. William Lutz, and the dinner was under the direct supervision of Mr. John Moore. Dr. Pearce, the present Chairman of Committee D-1 and also one of its long-time members, presided at the papers' session.

Apparatus Exhibit Was Marked Success

A RECORD number of ASTM members and visitors found temporary relief from the sweltering heat of New York by attending the 10th Annual ASTM Exhibit of Testing Apparatus and Laboratory Supplies. The air-conditioned Statler Ballroom, crowded with 73 exhibit booths, provided a colorful and comfortable scene for the display of scientific apparatus.

Judging by the daily exhibit attendance, most ASTM members and committee members found time in their tight meeting and session schedules to attend the Exhibit and impress exhibitors with their professional interest in the equipment displayed. Indications on every side, both during the show and after its close, were that visitor and exhibitor alike found the Exhibit the Society's most successful to date. Members and visitors found the displays particularly rewarding (a number went out of their way to inform the Staff of this), while a number of "old time" exhibitors commented that it was the best in which they had participated.

As is often the case, many items on display were designed for use in carrying out ASTM tests. However, many items fell into the category of general research instruments and as such were of interest to all visitors regardless of their specialties in the Society.

Of particular interest to visitors were the items shown for the first time. These included a new universal resistance wire strain gage, a surface coating analyzer, an impact tester for doped fabrics, a new abrasive cut-off machine for metallurgical samples, and a new type of universal testing machine. Numerous other new and interesting items amply rewarded the visitor for the short time investment needed to make the circuit of the Ballroom.

Overall, the Exhibit provided an excellent opportunity for members and committee members to obtain at first hand, and at one time and location, a comprehensive picture of developments in the apparatus field.

A list of companies exhibiting follows:

Aetna Scientific Co.
American Cystoscope Makers, Inc.
American Instrument Co.
American Optical Co.
Anderson Machine Shop, Inc.
Applied Research Laboratories
Atlas Electric Devices Co.
Baird Associates, Inc.
Baldwin-Lima-Hamilton Corp.
Beckman Instruments, Inc.
C. A. Brinkman & Co.
Brush Development Co.
Buehler Ltd.
Burrell Corp.
Carlson Co.
Central Scientific Co.
Consolidated Engineering Corp.
Corning Glass Works
Curry & Paxton, Inc.
Custom Scientific Instruments, Inc.
J. W. Dice Co.
Doble Engineering Co.
Eastman Kodak Co.
Eldorado Mining and Refining Ltd.
Fisher Scientific Co.
General Electric Co.
General Radio Co.
General Scientific Equipment Co.
William J. Hacker & Co.
Hanovia Chemical and Mfg. Co.
Instron Engineering Corp.
Jarrell-Ash Co.
Leeds & Northrup Co.
Lindberg Engineering Co.
Magnaflux Corp.
Micro Metallic Corp.
Milton Roy Co.
H. R. Moore Co.
National Forge & Ordnance Co.
National Spectrographic Sales Corp.
North American Philips Co.
Tinius Olsen Testing Machine Co.
Parr Instrument Co.
B. F. Perkins & Son Co.
Picker X-Ray Corp.
Radium Chemical Co., Inc.
Rainhart Co.
H. Reeve Angel & Co., Inc.
Riehle Testing Machines Division, American Machine and Metals, Inc.
Scott Testers, Inc.
Sperry Products, Inc.
Steel City Testing Machines, Inc.
Superior Electric Co.
Testing Machines, Inc.
Arthur H. Thomas Co.
Thwing-Albert Instrument Co.
Uddeholm Co. of America, Inc.
United States Testing Co.
Wallace & Tiernan Products, Inc.
Weston Electrical Instrument Corp.
Wilson Mechanical Instrument Division of American Chain & Cable Co., Inc.

WE THINK YOU WILL FIND OF CONSIDERABLE INTEREST the talk presented by Robert Burns, formerly chairman of Committee D-20 on Plastics, presented at the Annual Meeting of the Society of Plastics Engineers and published with SPE blessing on page 78 of this BULLETIN. It is a down-to-earth discussion of the work of the Society. It includes some thought-provoking philosophy on the significance of standards and it is expressed in Mr. Burn's own language, which to those who have read his former letters to Committee D-20 and some of his articles or book reviews, needs no description; to others, we commend the article and will let the author's style be its own advocate.

Outstanding Photographic Exhibit Held

Section on Metallography Particularly Interesting

THE Eighth Photographic Exhibit staged in the Ballroom Balcony of the Hotel Statler during the 50th Anniversary Meeting was a most interesting one and attracted a large number of visitors. The Section on Photomicrography, including particularly work on metallography, was outstanding. ASTM Committee E-4 on Metallography had before the meeting publicized this feature rather extensively and this, it was quite evident, bore fruit.

For the first time there was a section in the metallographic exhibit devoted to work by students, which resulted in a number of interesting entries. Committee E-4 has underwritten student prizes which are being given for the best work.

From time to time, a number of the prize-winning prints and photomicrographs will appear in the ASTM BULLETIN, there being some in this issue. A list of the prize winners in the various sections is given below.

Too much credit cannot be given the New York Photographic Committee headed by Myron Park Davis for their work in setting up what all agree was a most pleasing and instructive exhibit. The members of the committee worked virtually all day Sunday assembling and judging. The committee is particularly grateful to T. L. Counihan, Chief Metallurgist, Hyatt Bearings Div., General Motors Corp., Harrison, N. J., for receiving the prints and handling much of the preliminary work.

It will be of interest that Committee E-4 has set up a permanent exhibit committee headed by D. I. Finch, Leeds & Northrup Co., who is very active in the committee work and a member of this year's Photographic Committee. Further announcements will be made concerning the plans of this committee.

ASTM Apparatus Exhibit
at 50th Anniversary Meeting
Largest in Society History

PRIZE-WINNING PHOTOGRAPHS

General Photographs

FIRST: *Measuring Vacuum Tightness of Valve by Helium*, Wm. W. C. Wilke, Jr., Engineering Labs., Crane Co.
SECOND: *Deflection Tests on Steel Bridge Flooring Using Strain Gauges*, Earl P. Morgan, Research and Development Lab., U. S. Steel Co.
HONORABLE MENTION: *Static Bend Ductility Testing Fixture*, Charles L. Caudill, Chance Vought Aircraft

General Photographs—Special Technique

FIRST, SECOND, THIRD, AND HONORABLE MENTION: *Lueder Lines Photographed Without a Lens*, Francis M. Krill, Kaiser Aluminum & Chemical Corp.
THIRD: *Optical Function of a Glass Sphere*, Allie C. Peed, Jr., Highway Materials Research Lab., Kentucky Dept. of Highways

General Color Photographs (Print)

FIRST: *Test Method for Determining the Ability of Two Species of Fungi (X and V) to Utilize a Number of Plasticizers as a Source of Carbon*, Sigmund Berk, Pitman-Dunn Labs.
SECOND: *Prevention of Mold Growth on Leather*, Sigmund Berk, Pitman-Dunn Labs.

General Photomicrographs

FIRST: *Neuman Bands, Ingot Iron Extended Slowly at — 150 C*, T. G. Digges and Nesbit L. Carwile, National Bureau of Standards
SECOND: *Soft Solder Sweat Tube Joint*, Oliver E. Olsen, National Lead Co.
THIRD: *Alnico*, Virginia Bochenek, General Electric Co.
HONORABLE MENTION: *Molybdenum Disilicide*, Jacquelyne James, General Electric Co.
HONORABLE MENTION: *Basketweave Titanium Structure*, Edward C. Olden, Pitman-Dunn Labs.

General Photomicrographs—Special Technique

FIRST: *Removal of Surface Work and Polishing Scratches by Swab-Etch Technique (Partially & Totally)*, N. Raitt, Pitman-Dunn Labs.
SECOND: *Heat Tinting Aid in Phase Differentiation in Titanium Alloy Microstructures*, Daniel J. Maykuth, Battelle Memorial Institute
THIRD: *Superimposed Structures Brought Out by Phase Contrast in Stainless Steel*, E. J. Thomas and Mrs. L. Delisle-Pellier, American Cyanamid Co.

Nonmetallic Photomicrographs

FIRST: *Photomicrographs of the Surface Structure of Hog Bristle and Horsehair*, Carl W. Melton, Battelle Memorial Institute

Electron Micrographs

FIRST: *Resinography of Thin Cast Films of Polyacrylonitrile*, M. C. Botty, American Cyanamid Co.
SECOND: *52100 Chromium Steel*, W. L. Grube, Research Lab. Div., General Motors Corp.
THIRD: *Microstructural Changes Produced by Cold Work in Copper Single Crystal*, I. N. Zavarine, Sylvania Elec. Products, Mrs. Laurence Delisle-Pellier, American Cyanamid Co.
HONORABLE MENTION: *Particles of Chlorotrifluoroethylene Polymer*, Ernest F. Fullam, General Electric Co.
HONORABLE MENTION: *Pearlite-Plus-Tempered Martensite (15,000 ×); Bainite-Plus-Tempered Martensite (15,000 ×)*, T. A. McLauchlan, Research and Development Lab., U. S. Steel Co.

Electron Micrographs—Special Technique

FIRST: *Color Electron Metallography*, W. L. Grube, S. Rouze, T. R. McKinney, Research Lab. Div., General Motors Corp.

Electron Micrograph—Special Category

FIRST, SECOND, THIRD, AND HONORABLE MENTION: *Pitting Corrosion in Alcan 2S Aluminum*, H. J. Huff, Aluminum Labs., Ltd.

Particles

FIRST: *Polymorphic Transformation*, Walter C. McCrone, Armour Research Foundation
SECOND: *Wax Crystals #1*, Edwin A. Swire, Armour Research Foundation
THIRD: *Growth of Spherulites in Amorphous Vapor Deposited Selenium*, Nelson Brown, General Electric Co.
HONORABLE MENTION: *Fatigue Failures*, Christine Stopowy, Sam Tour & Co., Inc.

Color Spectra Transparency

FIRST, SECOND, THIRD, AND HONORABLE MENTION: *Visible Spectra on Kodachrome Type A Fibre*, Edwin S. Hodge, Mellon Institute

Color Photomicrograph Transparency

FIRST: *Determination of Differences of Orientation of Acicular Alpha Titanium Using the Sensitive Tint Plate*, Francis L. Ver Snyder, Thomson Lab., General Electric Co.
SECOND: *Basket-Weave Structure of Titanium Alloy*, Dr. Albert Borowik, Pitman-Dunn Labs.

Students

FIRST: *Titanium Alloy Ti-150A*, J. F. Watson, University of Michigan
SECOND: *Fly Ash—The Dust from Smoke*, R. L. Handy, Iowa State College
THIRD: *Constituents in Aluminum Alloy*, D. Goehler, Montana School of Mines
HONORABLE MENTION: *Slip Bands in Twinned Copper Crystals*, William J. Stenger, West Virginia University

Radiograph Transparency (Student)

FIRST: *Macroradiograph of Vertical Cross-Section Through Brass Ingot*, F. Joseph Dewez, Jr., West Virginia University

(*Continued from page 11*)

ture from 90 to 400 F and duration of time under stress up to 1000 hr.

The results in the investigation to determine the validity of plasticity theories and correctness of the assumptions made in these theories were the basis of the paper "Plastic Stress-Strain Relations for Biaxial Tension and Variable Stress Ratios" by Joseph Marin and L. W. Hu, Pennsylvania State College.

N. H. Murdza, Frankford Arsenal, presented the results of a series of round robin tension tests designed to determine the effect of speed of testing on the tensile properties of copper and copper-base alloys in his paper "Effect of Speed of Testing on the Tensile Properties of Copper and Copper-Base Alloys."

E. J. Ripling, in presenting the paper on "Restoration of Ductility of Cold Aluminum-Copper and Low Carbon Steel by Mechanical Treatment" prepared by N. H. Polakowski, University College of Swansea, showed that the ductility of certain work-hardened metals is rapidly and sometimes substantially improved by mechanical treatment inducing large cyclic deformations.

Characteristics of load-deflection diagrams of slow bend tests and crack development were described by Richard Raring, Naval Research Laboratories, in his paper "Load Deflection Relationships in Slow-Bend Tests of Charpy V-Notch Specimens." Results are compared, on the basis of energy absorbed and of transition temperatures, with those of impact tests on the same steels.

Generally the effects of cold work resulting from machining of specimens for mechanical tests are insignificant. G. W. Stickley and K. O. Bogardus, Aluminum Research Laboratories, showed in their paper "Effects of Machining Specimens on the Results of Tension Tests of Annealed Aluminum Alloys" that for annealed pure aluminum and aluminum alloys having yield strengths less than 10,000 psi there may be important effects upon values obtained for yield strength and to a lesser extent for elongation.

Sessions on Fatigue

COMMITTEE E-9 on Fatigue in carrying out its plan for sponsoring at least one session of papers dealing with fatigue at Annual Meetings, this year presented 15 papers on fatigue at three sessions.

The papers in the first session covered the statistical approach to such items as fatigue properties of SAE 4340 gun

tubes and the variability of the endurance limit and life to failure; the influence of metallurgical factors on fatigue variabilities; re-examination of conclusions with regard to fatigue of metals with particular respect to the understressing effect; a study of fatigue of large specimens with related size and statistical effects. The second and third sessions included papers on the damage produced in 75S-T aluminum by repeated loading at one stress amplitude measured by the relative reduction of fatigue life when the specimen was retested at a different test level; investigation of the coaxing effect of metals; anisotropy of fatigue properties using heats of steels which showed both high and low transverse average tensile reduction in area; effect of temperature, hardness and grain size on fatigue strength of a wrought nickel-cobalt-chromium-iron alloy; fatigue of chromium-molybdenum-vanadium and chromium - nickel - molybdenum - vanadium steels due to repeated applications of mechanical stress; plastic flow and work hardening of magnesium due to fatigue tests; fatigue of 76S-T61 aluminum under combined bending and torsion; machines for low temperatures and miniature specimens; fatigue effects on creep, rupture, and ductility properties; dynamic testing with a resonance vibration exciter and controller; and an extensive investigation showing that supposedly accurate, properly calibrated impact machines may give widely divergent results on the same material, indicating the difficulty or perhaps impossibility of standardizing the test in its present form.

Symposium on Recent Developments in the Evaluation of Natural Rubber

THIS symposium was developed by Subcommittee XII on Crude Natural Rubber, of Committee D-11 on Rubber and Rubber-like Materials. Organized in 1950 under the chairmanship of Norman Bekkedahl of the National Bureau of Standards, the subcommittee's present objective is to improve and develop methods of physical and chemical testing of crude natural rubber. Such research has become urgently needed since natural rubber has again become available in world markets. Wide variations have been found, however, in curing rate and processing characteristics of natural rubber and in the amount of foreign material present, all of which is in marked contrast with the uniformity which has been obtained in the manufacture of synthetic rubber.

Following introductory remarks by Chairman Bekkedahl, eight papers were presented covering technical classification of crude natural rubber; Mooney viscosity measurements of technically classified rubbers; the nonrubber content and the measurement of cure rate of TC rubber; vulcanization characteristics of natural rubbers; quantitative procedures for the determination of dirt in crude natural rubbers; preparation of a standard natural rubber; aspects of the testing of natural rubber; rubber evaluations with an Instron tester.

Symposium on Testing Adhesives for Durability and Permanence

MUCH importance is given to the integrity and accuracy of accelerated permanency tests on adhesives because of the fact that most of the adhesives now used have been developed in the last ten years and therefore background of actual long-time service is lacking. The papers in this symposium discussed specific as well as general applications and uses of simulated service and peformance tests.

"The Effect of Specimen Structure in Permanence Tests on Wood Adhesives," by Robert P. Hopkins, Rohm and Haas Co., stressed that greater emphasis should be attached to the construction of the test specimens in any efforts to interpret and develop test methods for wood adhesives. Factors considered were outdoor exposure, laboratory water immersion-air drying cycles, and tensile-shear strength.

The problems involved in the use of adhesives by the glass industry in glass products and in fabrication and installation of structural and decorative glass, are discussed in a paper on "Glass Adhesives," by Frank Moser, Pittsburgh Plate Glass Co. Bond strength is judged not only by the initial tensile strength but in its response to all conditions. Water immersion and weatherometer tests were used to assist in forecasting service life and durability.

The paper by R. F. Blomquist, Forest Products Laboratory, on "Current Investigations of the Durability of Woodworking Adhesives," confirms further the earlier statement that due to the relative newness of the present-day types of adhesives much importance is attached to the desirability for dependable durability and permanency of test methods in the absence of long-term test experiences. The author discussed factors contributing to failure of glued joints, present types of exposure tests for glued joints, long-term controlled laboratory exposures, long-term exposure to exterior weathering and other service conditions, and closed with a description of accelerated durability tests being used and also studied by ASTM Committee D-14 on Adhesives.

A program of research sponsored by Army Ordnance to investigate nonbiological factors leading to the deterioration of engineering adhesives was discussed in part in a paper entitled "Nondestructive Determination of Mechanical Properties and Deterioration of Adhesives," co-authored by A. G. H. Dietz, H. N. Bockstruck, and George Epstein, Massachusetts Institute of Technology. Mr. Dietz described the use of ultrasonic equipment and procedures which provided a definite means of determining the dynamic, elastic, viscous, and complex moduli of adhesive bonds. The deterioration of certain adhesives can be followed nondestructively by ultrasonic means. The effect of high-temperature deterioration of certain bonds was found to be that of physical rupturing under stresses caused by differences of thermal expansion of metal and adhesive, promoted by embrittlement of the adhesive due to overcure and oxidation at high temperatures.

The last paper of the symposium dealt with adhesives in the rubber industry under the title of "Field and Laboratory Tests for Durability and Permanence: Adhesives Belonging to the Rubber-Resin Systems." J. F. Anderson and L. F. Fiedler, the B. F. Goodrich Co., were co-authors of the paper. Mr. Anderson, in presenting the paper, reviewed some recent laboratory test methods for present-day rubber resin adhesives, such as are used in the automotive and aeronautical industries. These methods have served well in measuring the new class of bonding materials being used but a greater advancement is expected leading to 100 per cent evaluation of adhesive bonds without destruction or loss of materials, except those which should be rejected.

Symposium on Plastics Testing—Present and Future

THIS symposium, sponsored by Committee D-20 on Plastics, was developed as a critical examination of some of the procedures followed in determining certain physical-chemical properties of plastics. Its dual purpose was to describe, from the ASTM viewpoint, the present status of some of the tests for plastics; and to indicate the directions which future efforts toward standardization may take if recent contributions to theories of behavior of high polymers are given recognition in testing methods.

The first group of four papers dealt with measurements of mechanical strength properties; temperature effect on physical properties; color, gloss, and haze; and the effect of molding conditions on the permanence of plastics.

The final group of three papers provides specific examples of current

activities in the fields of accelerated exposure; rheology of thermoplastics; and examination of internal states of stress in cross-linked polymers.

Presiding as co-chairmen at the meeting were H. K. Nason, Monsanto Chemical Co., and C. R. Stock of American Cyanamid Co. Mr. Stock was in charge of the development of the program and it was he who presented the introduction. A summary statement of the papers was made by D-20 Chairman Gordon M. Kline of the National Bureau of Standards.

Session on Textiles

IN ADDITION to the Report of Committee D-13 on Textile Materials which submitted a number of new and revised standards, there were four interesting papers presented in the textile sessions.

The first paper on "An Engineering Approach to an Understanding of the Properties and Utilization of Textile Fabrics," by Walter J. Hamburger, Fabric Research Laboratories, Inc., presented an interesting discussion of the current trend to a systematic engineering approach to an understanding of textile fabrics as structural materials. In his paper Mr. Hamburger reviewed the many considerations that have been given this subject since the Nineteenth Edgar Marburg Lecture in 1944 by Harold DeWitt Smith on "Textile Fibers—An Engineering Approach to Their Properties and Utilization."

The second paper on "Status of Synthetic Textiles—Their Promise for the Near Future," by C. W. Bendigo, American Cyanamid Corp., predicted that the newer synthetic fibers will be produced principally in staple form and will be used largely in blends to produce fibers of superior qualities. He indicated that between 1950 and 1953 the rate of production of all the newer synthetic fibers will increase 300 per cent with a total installed capacity of over 400,000,000 lb in place next year. By 1970, the rate for the non-cellulosic synthetic should be near a billion pounds annually. During the same period, the production of cellulosic fibers should be approximately double.

In addition to rayon and acetate, there are at least ten other important synthetic fibers being produced in the United States. He foresaw increases in rayon for industrial fabrics, increases in acetate for apparel, nylon for apparel and industrial uses, glass fibers for industrial uses, and in acrylics for the entire warmth field and for producing fabrics with ease of maintenance. The year 1952, he said, will go down in textile history as the acrylic fiber year. In this year the large Orlon staple plant started, the Acrilan plant began operations, X-51 acrylic fiber was announced, Industrial Rayon's acrylic fiber underwent mill evaluation, and at least two other types of acrylic fibers were being tried privately. In addition, the partially acrylic fiber dynel was slated for considerable expansion. Up until this year, principal production of acrylic fiber has been in filament form, but the big future for the acrylics, he said, is in staple.

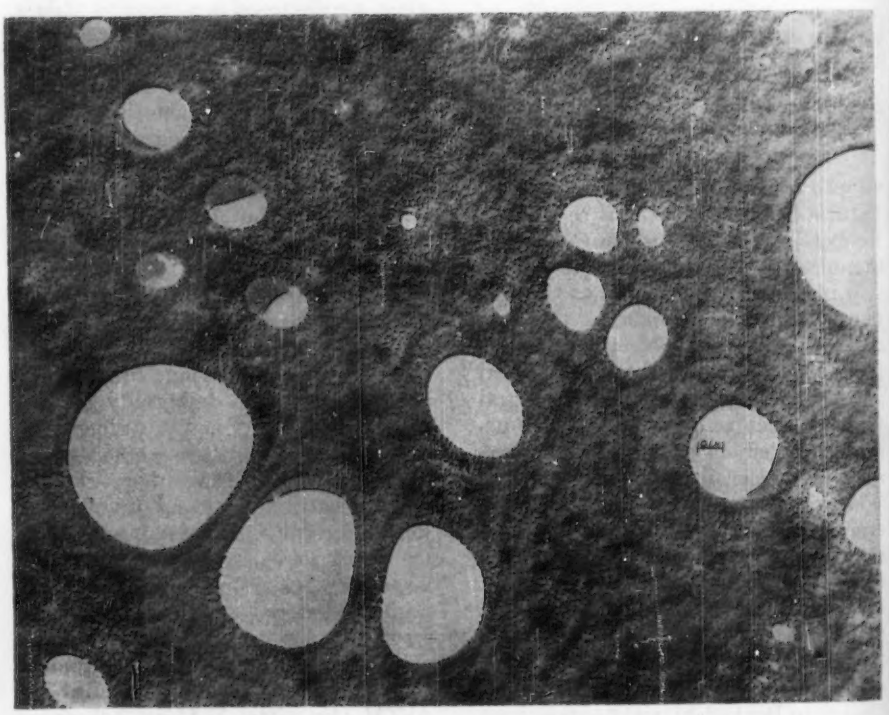
With so many new fibers and with their principal use being in blends, Mr. Bendigo maintains that textile products will be engineered for specific performance characteristics.

"Statistical Consideration in Fiber Research" was discussed by Thomas F. Evans, Textile Research Institute, Inc. Mr. Evans showed in his paper that, when statistical principles are employed in design and analysis, studies of single fibers involving chemical or physical tests can be made to yield more precise or more informative data. As examples of the application of statistical technique to fiber research, he considered at length (1) the problem of designing an experiment for investigating the effects of several variables on the physical properties of wool fibers, and (2) the estimation of the number of tests to perform in a study.

A statistically designed experiment in which all the variables were allowed to vary simultaneously were contrasted in both form and efficiency with a conventional experiment in which one variable at a time was studied. The advantages of the statistical approach—the increase in precision, the discovery of interactions, and the setting of confidence limits—were discussed and illustrated by an example in which the effects of prior straining on the physical properties of wool fibers are studied.

"Applications of Statistics to Quality Control in the Textile Industry" was discussed by Robert Jones, Bigelow-Sanford Carpet Co. Mr. Jones considered the problem of sample inspection using the tensile strength of cotton yarn as the subject, since the strength of yarn is of major concern in quality control of a textile operation.

One area in which statistical quality-control methods have great application is that of testing shipments of purchased yarn as part of an acceptance inspection procedure. The inspection department has to make several choices in setting up an inspection plan and must evaluate the factors so as to develop an economic balance between the quality protection desired and the cost of performing the inspection. Some of the decisions to be made are indicated by the following: (1) What is considered definitely



Resinography of Thin Cast Films of Polyacrylonitrile
First prize, Electron Micrograph, in the Eighth ASTM Photographic Exhibit, by M. C. Botty, American Cyanamid Co. Magnification: 92,000 ×. Reduced about ⅓ in printing.

acceptable quality? (2) What is considered definitely unacceptable quality? (3) What is the allowable chance or risk ("producer's risk") of rejecting a shipment that is actually acceptable? (4) What is the allowable chance or risk ("consumer's risk") of accepting a shipment that is actually not acceptable?

Mr. Jones pointed out that whatever the characteristics or product to be checked, the inspection group must decide its quality requirements, define the plan, employ a sound test method, and evaluate the results according to the established plan.

Symposium on Fretting Corrosion

AFTER being under consideration by several of the Society's Committees for a number of years, a symposium on fretting corrosion became an actuality at the Fiftieth Anniversary Meeting of ASTM. Fretting corrosion has been defined as an oxidation of the mating surfaces of two parts when pressed closely together, as in a press fit or a tight bolted assembly where there is some relatively minute oscillatory motion between the two surfaces. The session consisted of five papers and an NACA film on research on fretting. The papers, all illustrated by slides, covered present status of fretting wear, fretting corrosion tendencies of several combinations of materials, fretting corrosion in fitted members, effect of lubricants in minimizing fretting corrosion, and the mechanism of fretting corrosion.

An audience of around 150 attended the session providing periods of lively discussion.

Session on Durability of Concrete

DURABILITY of concrete is affected by many factors. Committee C-9 on Concrete and Concrete Aggregates has been very active for many years in searching for truths in order to analyze these factors. This group of papers represents the efforts of several of the committee members in pursuing certain avenues of approach through test programs and the collection of data.

The paper by C. H. Scholer, Kansas State College, on "Significant Factors Affecting Concrete Durability" concludes that most of the progress in producing better concrete is based on the discovery that air and water voids of the hardened concrete exert a controlling influence over its resistance to freezing and thawing action; that aggregates are not chemically inert materials bonded together by an inert cement gel; and that in mass concrete construction it is desirable to use a minimum of the cementing medium consistent with adequate strength to reduce the heat of hydration and resulting volume change.

The second paper, "Correlation of Sodium Sulfate Soundness of Coarse Aggregate with Durability and Compressive Strength of Air-Entrained Concrete," by C. A. Vollick and E. I. Skillman, Bureau of Reclamation, as the title indicates, presented test results on the relationships of these variables. In comparing coarse aggregates from 70 sources one of the conclusions drawn indicated that from statistical analysis a correlation exists between freezing and thawing durability of air-entrained concrete and soundness of the coarse aggregate as measured by the sodium sulfate test.

The results obtained from the exposure to actual weathering of more than 2500 concrete specimens over a 16-year period formed the basis for a paper entitled "Experimental Esposure of Concrete to Natural Weathering in Marine Locations," prepared and given by H. K. Cook, Corps of Engineers. The author pointed out the advantages and value of this type of long-time exposure. Tidal environment and sea water at both low and high temperatures contributed to the severity of the tests. Several significant conclusions were drawn pertaining to the use of air entrainment, non-air-entraining admixtures, blending of natural and plain portland cement, absorptive form lining, horizontal construction joints, and certain special cements.

Conclusions drawn by actual observation of individual small concrete test beams were discussed and illustrated in the paper by W. J. McCoy and S. B. Helms, Lehigh Portland Cement Co., entitled, "Performance of Concrete Specimens During 10 Years Exposure to Severe Natural Weathering." The exposure subjected the specimens to at least 50 cycles of natural freezing and thawing each winter while in a state of saturation. Modulus of rupture of elasticity by the sonic method was also used to evaluate the resistance to weathering. Myron A. Swayze, Lone Star Cement Corp., in a discussion on this paper, stressed the need for more refinement in freezing and thawing test method techniques and the danger of being too complacent over acceptance of test results.

The final paper by A. D. Conrow, Ash Grove Lime and Portland Cement Co., "Studies of Abnormal Expansion of Portland-Cement Concrete," presented data on investigations on severe cracking of portland-cement concrete in the Central Great Plains region. The significant conclusion presented was that the development of abnormal expansion in concrete can be prevented or greatly decreased if a suitable pozzolanic material is incorporated in the concrete mixture in the proper amount, either as a blend with the portland cement or as an addition to the concrete mixture.

Session on Cement, Concrete, and Mortar

EXPANSION of mortar with resulting cracking in masonry walls has become a widespread subject of serious discussion and study. J. W. McBurney, National Bureau of Standards, in the opening paper of this session, discussed the effect of free magnesium oxide in causing the expansion of hardened masonry mortars and recommended the inclusion of an autoclave test requirement in masonry cements and cement-lime mixtures for use in mortar as a means of controlling unsoundness. A prepared discussion by C. E. Wuerpel, Marquette Cement Mfg. Co., supported the views of Mr. McBurney in recommending the use of an autoclave test to measure expansion.

A second paper relating to the expansion of mortars from an entirely different cause was presented by Richard C. Mielenz, Bureau of Reclamation, entitled "Chemical Test for Alkali Reactivity of Pozzolans." This paper was co-authored by K. T. Greene, E. J. Benton, and F. H. Grier, also of the Bureau. A new chemical test was described for determining quickly the ability of a pozzolan to control expansion of mortars resulting from reaction between cement alkalies and susceptible aggregates. The test procedures involve the determination of the net reduction in alkali concentration of a 0.5 *N* sodium hydroxide solution after reaction with the pozzolan in the presence of calcium hydroxide. The test is recommended for use in specifications covering the selection and control of pozzolans and can be performed and completed in two workdays.

David Wolochow, National Research Council of Canada, presented the report of the Working Committee on Sulfate Resistance of Committee C-1 on Cement. Results were discussed and reference made to tabulations covering an extensive cooperative test program using two proposed methods, one being a lean mortar-bar expansion test and the other a sulfate susceptibility test. Those two methods are recommended for use by those interested in studying the sulfate resistance of cements. It is hoped that by more extensive use a larger volume of data may become available for developing a test method suitable for specification purposes.

Efflorescence is another well known and visible phenomenon of masonry walls which has received considerable

attention. Viewpoints have ranged from its being regarded simply as a displeasing and superficial surface appearance to its being considered as a serious disintegration. F. O. Anderegg, formerly with the John P. Pierce Foundation and now a consultant, discussed this subject in a paper as part of this session. An analysis is given of the factors contributing to efflorescent phenomena, including mention of the source of efflorescing compounds, the role of water in efflorescent action, laws of solutions and efflorescence, and the laws of crystal growth.

The use of Mohr's theory as an analysis of failure has been considered by many in the field of soils and concrete. The last paper in this session presented a general analytic solution for Mohr's envelope, prepared by Glenn Balmer, Bureau of Reclamation. A brief résumé of the paper was given by Douglas McHenry, also of the Bureau. The major conclusion drawn is that certain engineering materials produce definite evidence that Mohr's envelope is a curve rather than a straight line when the experimental data for such materials are analyzed by Mohr's theory.

The Sanford E. Thompson Award for the best paper of the year on research in concrete and concrete aggregates was presented to H. F. Gonnerman and William Lerch, Portland Cement Assn. for their paper, "Changes in Characteristics of Portland Cement as Exhibited by Laboratory Tests over the Period 1904 to 1950."

Symposiums on Soils

EXCHANGE phenomena in soils and direct shear testing of soils were subjects for two symposiums sponsored by Committee D-18 on Soils for Engineering Purposes.

Exchange Phenomena:

Exchange phenomena, or ion exchange reaction, is discussed from the standpoint of the necessity of understanding these phenomena in order to understand the nature of the properties of soils. Five papers were given on various applications and experiences in connection with the subject.

"Ion Exchange in Relation to Some Properties of Soil-Water Systems," by Ralph E. Grim, University of Illinois, presented interesting information on the complexity of exchange reaction, the influence of exchangeable cations on physical properties, anion exchange, and organic exchange reactions as found in clay materials. Cation exchange capacity of loess was discussed in a paper by Donald T. Davidson and John B. Sheeler, Iowa State College. Mr. Davidson concluded among other things, that the cation-exchange capacity varied considerably, as found in studying Wisconsin loess, this being mainly attributed to the variation in clay content. Further, cation-exchange capacity has a direct application to engineering soil problems. The first of two papers by Hans F. Winterkorn, Princeton University, dealing with surface-chemical properties of clay minerals and soils, concluded that data and theory indicate the potential usefulness of electro-osmosis for characterizing soils with respect to their quality subgrade materials. The second paper, in discussing job experience with exchange phenomena involving inorganic and organic ions, stressed the importance of exchange phenomena in soil engineering with a need for carrying the tremendous amount of laboratory knowledge already available into the field.

The last paper of the symposium illustrated the utilization of increasing amounts of calcium-hydroxide additions to expansive clays, in excess of the total required for ion exchange, solution and carbonation, for improving the mechanical properties. This paper was co-authored by Irving Goldberg and Alexander Klein, University of California, and presented by R. E. Davis. A summary by E. F. Preece, Corps of Engineers, cited this symposium as being a significant contribution to the engineering application of soil physico-chemistry, especially in its being a cooperative undertaking on the part of the applied scientist and the engineer.

Direct Shear:

The fact that a direct shear test method has a useful place in the family of standard methods for determining the engineering properties of soils is exemplified in the several papers presented as a symposium on this subject. D. M. Burmister, Columbia University, in his paper, "The Place of Direct Shear Test in Soil Mechanics," noted its principal use is for the determination of the maximum shearing strength and angle of friction of soils in stability analysis. Mr. Burmister discussed stress and strain restraint conditions as well as the need for recognizing the influence of controlling conditions by the construction of structures.

The many applications of direct shear tests in highway design were reviewed in a paper by Edward S. Barber, University of Maryland. It was pointed out that this test is useful for indicating the effect of various factors on soil strength and can give results applicable to structural design.

In "Use of Direct Shear Tests in Earth Work Projects Under Construction," R. R. Proctor, Los Angeles Department of Water and Power, described a shear machine and procedure for testing 4-in. diam compacted soil specimens in double shear. The author outlined application of test data to design and construction with the conclusion that although test and field control procedure is still in the process of development, the methods described are resulting in a closer relationship between design and construction than was previously secured.

R. G. Hennes, University of Washington, presented a paper in which he attempted to correlate internal friction with grain size and shape for cohesionless material. Direct shear tests were run on river gravel and crushed basalt. His conclusions were that for clean dry aggregates the peak value of internal friction is greater for macadam-type aggregates than for dense-graded aggregates of equal maximum size. The effect of particle shape and of surface texture are of only moderate importance for macadam-type aggregates. The paper, "A Direct Shear Test with Drainage Control," given by D. W. Taylor, Massachusetts Institute of Technology, concluded that if shearing strength for a no-drainage condition by direct shear tests is to be satisfactory, careful consideration must be given to prevention of drainage. The maintenance of a constant thickness of sample during shear appears to give satisfactory results.

Symposium on Non-Destructive Materials

COMMITTEE E-7 on Non-Destructive Testing rounded out one of the busiest and most productive years in its history with a technical session on Thursday, June 26. The program, organized by Subcommittee IV on Technical, Economic and Application Data, was designed to augment R. C. McMaster's Marburg Lecture on "Non-Destructive Testing."

The great interest currently being shown by industry in non-destructive testing was reflected by the audience of more than 150 who attended the session.

Since the 50th Anniversary Meeting followed the Triennial Meeting International Organization for Standardization, the Committee invited several foreign authorities in the field of non-destructive testing to participate. Four of the authors were able to present their papers in person, and the balance of the foreign papers were presented by Americans skilled in the various fields.

The object of the program was the presentation of practical examples of non-destructive testing, and under the technical chairmanship of J. C. Smack,

Sperry Products, Inc., and D. T. O'Connor, Naval Ordnance Laboratory, the audience was treated to several interesting examples of current European practices. In addition, a recent American development of extreme interest was presented by William Hitt, Chief Inspector of Douglas Aircraft, Santa Monica, Calif. In this paper the development and use of immersed reflectoscopic inspection techniques on aircraft components was discussed.

Alexander Gobus and Noah Kahn reviewed the work of Subcommittee II on Radiographic Standards for Steel Welds in preparing Standard Comparison Radiographs of Steel Welds. This work, taking two years to assemble and classify, is of great immediate interest to the welding industry.

The program, which was arranged by S. A. Wenk of Battelle Memorial Inst. will be published in a Special Technical Publication.

Symposium on Light Microscopy

THE Symposium on Light Microscopy was sponsored by Committee E-1 on Methods of Testing, through a special committee under the joint chairmanship of F. G. Foster, Bell Telephone Laboratories, and R. P. Loveland, Eastman Kodak Co.

In a review of "The Methods of Microscopy," Prof. C. W. Mason, Cornell University, pointed out that the practice of technical microscopy involves high quality of knowledge, instruments, and related manipulation. Optical requirements for determination of particle size, special apparatus and training for studies of crystal properties, extensive accessory knowledge for the interpretation of metallurgical and ceramic specimens, and the possibility of correlation with nonmicroscopical tests and data—all illustrate the diversity of methods and applications which this symposium brings together.

These same factors also emphasize the impossibility of standardization of many of the important methods of technical microscopy, and may de-emphasize the quantitative aspects, since interpretation of structure may often be made directly in terms of quality or behavior, rather than *via* a number.

If a material consists of an aggregate of two or more components, it is more significant to observe microscopically their amount, fineness, and arrangement and the manner of abrasion, deformation, or other failure of these components than it is merely to measure properties of the mass as a whole. The latter may appear more "practical," but the analysis of test behavior in terms of microstructure is necessary for real understanding and improvement of performance.

Professor Mason suggested that materials engineering should involve experience and reasoning in terms of "close-ups." A microscopical background develops this way of thinking even without continual recourse to the instrument. He pointed out that its very directness makes for realistic interpretations of test data, and in addition local variations and unexpected structures will be recognized as they can never be from curves and tables.

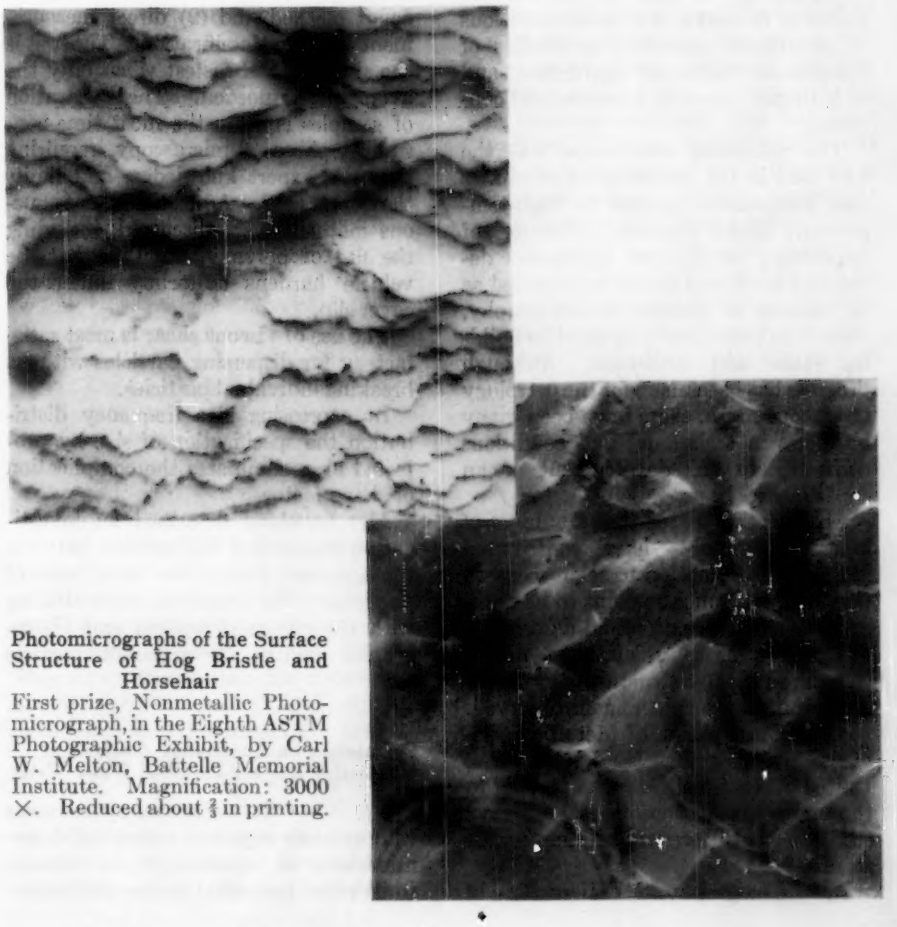
A survey of "Apparatus for Microscopy" by H. W. Zieler, of W. H. Kessel and Co., described two trends in apparatus development. The first included the use of apparatus to widen the applicability of the microscope as a magnifying instrument. Depending upon whether the object is transparent, opaque, colored, or colorless, special devices have been developed for illumination by transmitted as well as by reflected light. The most recent development is the equipment for phase microscopy, in which applications the microscope serves for qualitative and quantitative morphological analysis.

The second trend is apparatus to extend the application of the microscope beyond its original purpose to qualitative and quantitative analysis of optical and other physical properties of small objects. Typical is the polarizing microscope with numerous accessories for the determination and measurement of optical properties. Apparatus serving for the determination of other physical properties such as melting point (heating stages), hardness (micro hardness testers) fall into this category.

Mr. Zieler also discussed recent equipment for micro-spectrophotometry in ultraviolet, visible, and infrared light, supporting chemical analysis.

"Some Applications of Light Microscopy in the Study of Textile Materials" were described by Verne W. Tripp, Southern Regional Research Laboratory. The examination of fibers, the basic unit of textiles, has been of greatest concern to the textile microscopists. The extension of techniques developed for fiber examination to yarns and fabrics has, however, broadened considerably the scope of work in this field.

The qualitative identification of fibers is quite widely used by examination of the fibers in longitudinal or in cross-sectional view, followed by a comparison of authentic specimens. The quantitative aspects of textile microscopy involve the direct or indirect measurement of the diameter, thickness, or cross-sectional area of the fiber. The behavior of fabrics under conditions of



Photomicrographs of the Surface Structure of Hog Bristle and Horsehair

First prize, Nonmetallic Photomicrograph, in the Eighth ASTM Photographic Exhibit, by Carl W. Melton, Battelle Memorial Institute. Magnification: 3000 ×. Reduced about ⅔ in printing.

use can be studied and often explained by microscopic examination of their weave, construction, and inter-yarn relationships. Surface examination at low magnification will reveal the grosser details of construction and fabric geometry. Observation of thin sections cut through the warp or filling of the intact fabric is more pertinent, however, as it definitely establishes fine constructional details.

The author also reviewed briefly other important techniques such as the use of phase contrast by which the skin on viscose rayons may be revealed without staining. This phase contrast deserves exploration in fiber structure research. Other special techniques such as ultraviolet, fluorescence, and infrared microscopy make microscopy an extremely flexible tool in textile studies.

A very excellent description of "Polarized Light Microscopy of Crystals" was presented by W. C. McCrone, Armour Research Foundation, with a number of interesting illustrations.

"Applications of Light Microscopy in Concrete Research" were described by Katharine Mather, Concrete Research Div., Waterways Experiment Station, Corps of Engineers. Mrs. Mather stated these are outgrowths of applications in petrology, mineralogy, and chemistry, but there is more quantitative emphasis.

Microscopy is used in the investigation of cement and other cementitious or pozzolanic materials, in studies of natural and artificial aggregates, and of hydrated cements, mortars, and concretes.

The polarizing microscope was the tool used in the identification of phases and compounds formed in high-temperature phase research. The use of microscopy on natural aggregates developed later, and might be regarded as an offshoot of descriptive petrography, related to petrography applied to building stone and roadstone. Although progress has been made for the petrology of igneous rocks, there have been many obstacles in techniques and conditions necessary to the development of an experimental basis.

Mrs. Mather stated that a number of ingenious students have contributed ideas and information to microscopy in this field, but much remains to be done, in terms of observation and description of microstructure, relation of microstructure to larger structures, and in interpretation of the phenomena observed.

"The Examination of Metallic Specimens" was described by J. R. Vilella, United States Steel Co., who pointed to the many applications in metallurgical studies of both ferrous and non-ferrous metals.

In "Resinography, the Microscopy of Resins and Plastics," T. G. Rochow, American Cyanamid Co., reviewed the studies both quantitatively and qualitatively of high-polymer materials which may vary in size from beads of multiple thermoplastics to the latices of rubber and synthetic extensomers. He also gave examples of studies of consolidated resin phases which are characteristically noncrystalline (amorphous) but may contain microscopic crystalline phases, such as in resin sizes for paper. He reviewed applications to various plastics, paints, and extensomers which contain nonresinous particles such as fillers, reinforcing agents, pigments, air pores, etc. The distribution of these throughout the resin is easily determined microscopically by reflected light. Likewise flaws, such as bubbles, cracks, and foreign bodies, are detected, mapped and often recognized.

Mr. Rochow stated that whereas microscopical results may be important as such, the microscopist can improve his value by interpreting his data in terms of preparation or behavior of the resin for technologists to use in correcting production-troubles, in developing resin-processes and in synthesizing new resins.

"Methods of Particle Size Analysis" were reviewed by R. P. Loveland, Eastman Kodak Co., who stated that there are two microscopic methods (1) the count method and (2) direct measurement and size classification. The first is the simplest and fastest when only the average size is needed. The preparation of samples is often the most time-consuming phase of microscopy, requiring the most expert knowledge, and limits the final results. Aqueous and nonaqueous methods were discussed, including the use of polymerization so that the vehicle hardens uniformly under the cover slip.

The use of viscous shear is most satisfactory for dispersing particles without breaking individual particles.

In expressing size frequency distribution the specification of size by projected area eliminates the complication of shape factor.

Mr. Loveland described an investigation concerning the relation between the apparent *versus* the "true" size of particles. He presented data dealing with the effects of optical and photographic factors on apparent particle size.

Symposium on Continuous Analysis of Industrial Water and Industrial Waste Water

THERE are many instances where closely repeated individual determinations of constituents or characteristics of industrial water and industrial waste water may advantageously be replaced by methods for the continuous determination of the desired information, with the results being automatically recorded on charts.

In order to aid in the general dissemination of knowledge concerning continuous methods of analysis of industrial water, Committee D-19 on Industrial Water sponsored an all day symposium at which, following the introduction by B. W. Dickerson of Hercules Powder Co., papers were presented covering automatic sampling, practical aspects of the measurements of pH, electrical conductivity and oxidation-reduction potential, continuous recording of chlorine residuals and determination of chlorine demand, measurement of color, turbidity, hardness, and silica, and continuous measurement of dissolved gases in water.

An attendance of some 80 persons and very extensive discussion of the papers, gave evidence that the symposium was timely and well received.

Symposium on Test Methods for Process Control in Ceramic Whitewares

PROCESS control is an important part of every industry. In the field of ceramic whitewares, this is especially true because the products are the result of the direct use of basic mineral materials such as clay and kaolin. The control of the chemical and physical properties of such basic materials requires constant and careful attention at all times. This symposium presented some of the approaches and problems involved in process control of ceramic whitewares.

Following a general introduction of the subject by C. G. Harman, Battelle Memorial Institute, the first paper discussed the status and importance of terminology. Ralston Russell, Jr., Ohio State University, presented the paper for the author, Arthur S. Watts, also of Ohio State University. General misuse of terms is very prevalent in the whitewares industry and the resulting confusion is such that one of the major efforts of ASTM Committee C-21 on Ceramic Whitewares has been to eliminate this condition by developing standard definitions of terms.

The adaptation of research tools for process control was discussed in the second paper by Edward J. Smoke, Rutgers University, co-author with John H. Koenig of the same institution. The authors selected for discussion a few of the many possibilities available in research. The control and measurement of particle-size distribution of raw materials, bodies, and glazes by various methods; chemical analysis by spectrographic, polarographic and X-

ray means; crystal analysis of materials and products; nondestructive testing of whiteware by several means; were described to show some of the resources available in research.

The modulus of rupture, or flexural strength, is the most commonly measured and desired property of ceramic whiteware materials. The paper by Rolland Roup, Globe-Union, Inc., presented by H. Z. Schofield, gave a progress report on a series of round-robin tests of considerable magnitude for measuring flexural strength. The author outlined the objectives of the tests which include observation of the dispersal of results, effects of various kinds of apparatus, effect of size and shape of cross-sections, and the ascertaining of the possibility of developing a standard ASTM method.

Determination of subsieve particle size was described by C. J. Koenig, Ohio State University, in a paper co-authored with A. Kent Smalley, also of Ohio State University. Several methods involving different types of apparatus were discussed and then qualifications and limitations mentioned. In comparison, it was noted that the microscopic count method probably affords the most precise and absolute information but Stokesian methods appear to offer the most practical approach.

Critical properties of whiteware clays were dealt with in the paper by T. A. Klinefelter, U. S. Bureau of Mines, and delivered by H. P. Hamlin. The several stages in the processing make different properties of the raw materials important for each stage. The pre-fired stage calls on requirements in plasticity, castability, strength, and shrinkage, whereas the fired stage emphasizes vitrification, color, thermal expansion, dielectric properties, and refractoriness;

Symposium on Conditioning and Weathering

THIS symposium was sponsored by Committee E-1 on Methods of Testing, through a special committee headed by Robert Burns, Bell Telephone Laboratories. One purpose was to bring up to date the many improvements in conditioning and weathering equipment and applications to engineering materials.

In the general introduction, A. C. Webber, E. I. du Pont de Nemours & Co., who also served as chairman of the session, reviewed the work in Committee E-1, which has had a subcommittee on this subject since 1937 to coordinate conditioning and weathering methods in use.

"Fundamentals of Atmospheric Elements" was discussed at length in the paper by B. C. Haynes of the United States Weather Bureau which was presented by A. C. Kussman of the New York Weather Bureau. The general effects of weather on the erosion and deterioration of materials have long been recognized, but only in the last few years has it been possible to relate cause and effect by direct measurements. Mr. Haynes outlined methods of measuring atmospheric elements, and also discussed local variations which may be expected when the basic data used are observed from a standard weather station. The variations in the weather elements from day to day, month to month, and even year to year, require careful consideration when weathering tests are conducted. Also it is the local climate that directly affects the individual person and the materials that he uses.

In discussing "Conditioning and Weathering of Paper," William R. Willets, Titanium Pigment Corp., pointed out that the main atmospheric component is relative humidity, which determines the moisture content of paper. Moisture in paper acts as a plasticizer and affects its strength, rigidity, and plasticity. Variations in moisture content produce dimensional changes in the fibers, which in turn are translated into over-all changes. Mr. Willets presented examples showing the importance of relative humidity in testing and also in specifications for paper, in converting, and also in the end use of paper and paper products.

"Laboratory Air Conditioning" was reviewed by A. E. Stacey, Jr., the Carrier Corp., who pointed out that several types of laboratories with varying requirements may be divided as follows: (1) control, (2) research, and (3) development.

In general, production control laboratories are standardized throughout, but in research and development laboratories, the air conditioning system must be flexible so that the environmental conditions may be changed to fulfill other requirements. There may be many unknown variables which affect not only the capacity but also the operation of the system and for which the system must be planned.

"Weathering Tests on Metallic Coatings" were discussed by William Blum, Consultant, formerly of the National Bureau of Standards. He covered the factors involved in outdoor exposure tests such as (1) climate, (2) arrangements of specimens and racks, (3) methods of inspection and rating, (4) treatment during tests, and (5) cost of exposure tests; and reviewed the many uses and applications of results of such weathering tests. He emphasized that atmospheric exposure tests of metallic coatings are useful and justifiable to the extent that they confirm and extend observations of actual service and throw light on the causes and remedies for failures.

"Development of a Moisture Resistance Test" was discussed by C. P. Lascaro, Signal Corps Engineering Laboratory. This paper presented a narrative account of work conducted by the Signal Corps on the development of a standard cycle for moisture resistance test of component parts for use in electrical equipment. To improve the performance of communication equipment under tropical conditions, many protective techniques, such as the use of hermetic seals, coating materials, impregnants, etc., have been developed and used. To determine conformance characteristics, consideration was given to the development of some type of a humidity or immersion test, or salt spray exposure test that could be included in specifications. The first step was to identify the tropical field conditions and type failures. The average tropical temperature was 80 F with a usual diurnal change from 12 to 15 F. In open field storage, under tarpaulins, and in the holds of ships, storage temperatures might reach 150 F. Consideration also had to be given to the presence of a polarized potential across insulation which would accelerate the corrosion of conductors, expecially fine wires and those cases where galvanic coupling corrosion might occur. A test cycle for the moisture resistance test has been developed that has been in continuous performance for nine years in the testing of approximately 50,000 component parts of about 30 different types.

The paper on "Outdoor Exposure Testing on Racks and Test Fences," by K. G. Compton, Bell Telephone Laboratories, discussed the influence and interrelation of the many factors on several kinds of materials, as, for example, the specific location, the angle and direction of exposure, shelter or boldness of exposure, and season of the year at which the test started. It is not sufficient to know that the deterioration has a certain rate in a general area, such as New York or Florida. Detailed conditions of exposure may be the determinate of this rate rather than the general geographical location.

In his paper on "Accelerated Weathering Devices," R. H. Sawyer, Devoe and Reynolds Co., reviewed the development of mechanical weathering machines that has resulted from investigative studies in various laboratories with many variations of the central theme of using ultraviolet light and water. In the use of accelerated

weathering tests, there has been a growing recognition of the need to isolate those variables which are most controlling in the weathering process. This is being done for many materials by the establishment of suitable test cycles. An even more important development in the accelerated prediction of performance in exterior service will be the development of procedures for the evaluation of minor material changes on short exposure to natural weather and the extrapolation of these small changes to expected serviceability which will permit an accelerated answer without accelerated weathering. If this approach proves to have real promise, the next step may be to develop a mildly accelerated laboratory cycle which does not exaggerate either in time or intensity by a large factor so that physical deterioration proceeds slowly, but by physical testing it will still be possible to extrapolate to the probable result of longer exposure cycles.

The paper on "Conditioning and Weathering of Adhesives and Plastics," by Frank Reinhart, National Bureau of Standards, presented a review of the various methods on this subject developed by ASTM Committees D-14 on Adhesives and D-20 on Plastics, and also reviewed the present studies under way in these committees.

Symposium on Determination of Elastic Constants

THE renewed interest in methods for determining elastic constants stemming from the rapidly increasing use of metals at elevated temperatures in engines of many types and the use of plastics and composite materials in aircraft gave impetus to the development of a symposium on the subject as part of the Annual Meeting program. This symposium was arranged by the Task Group on Elastic Constants under the auspices of Committee E-1 on Methods of Testing.

The general impression gained from the symposium was that there is a need for more determinations of such quantities as modulus of elasticity, modulus of rigidity, and Poisson's ratio for more materials. The necessity for accuracy of determinations cannot be overlooked, but there also are other needs, as suggested by the following questions. What variation in magnitude can be expected for a given quantity for a given material? How can the engineer's thinking be directed so that he expects and understands such variations? What is the significance of static and dynamic determinations and what is the relationship between them? What should be done about the elastic "constants" for materials such as cast iron, concrete, and plastics which have stress-strain diagrams that are curved essentially from the origin?

Walter Ramberg of the National Bureau of Standards, chairman of the symposium group proposes to make a survey of present methods of determining elastic constants in Europe during a forthcoming trip abroad, and to report the results at a later date.

COMMITTEE NOTES

The following notes are intended to give some idea of the major accomplishments and activities of the various technical committees as reported at the Annual Meeting.

The notes are in order of the serial designation of the Committees, "A" group first, "B," etc. Some of the "E" work is of direct interest to the other groups.

Committee A-6 on Magnetic Properties

COMMITTEE A-6 on Magnetic Properties recommended revision of Standard Methods of Test for Electrical and Mechanical Properties of Magnetic Materials (A 344 – 49) and is currently letter balloting the committee for action on Standard Methods of Test for Alternating Current Core Loss and Permeability of Magnetic Materials (A 343 – 49) with the thought that the tentative revision of this standard may be submitted to the Administrative Committee on Standards in time for inclusion in the 1952 Book of Standards. The changes in connection with A 343 are designed to permit the use of smaller test specimens.

The committee is currently considering standard specifications for oriented electrical steel of AISI types M-7, M-8, M-9, and M-10.

Another major activity of the committee is that pointing toward the writing of a "Manual of Magnetic Testing" which undoubtedly will be used extensively by those interested in magnetic testing.

Committee A-5 on Corrosion of Iron and Steel

OF INTEREST not only to industry but to farmers throughout the country is the new Tentative Specification for 1.25-oz Ordered Coating (Pot Yield) Zinc-Coated (Galvanized) Iron or Steel Roofing Sheets prepared by Committee A-5 and recommended for approval by the Society. Other recommendations include revisions in A 93 – 50 T, Tentative Specifications for Zinc-Coated Sheets, to expand the bend-test table to include gages heavier than No. 16 galvanized sheet gage, to delete all reference to sheet weight tests, and to clarify the term "Ordered Coating" by adding the term "Pot Yield"; revision of A 326 – 49 T, Tentative Specifications for Zinc-Coated (Galvanized) High Tensile Steel Telephone and Telegraph Line Wire and A 111 – 51, Standard Specifications for Zinc-Coated (Galvanized) "Iron" Telephone and Telegraph Wire, to permit binding coils of wire with steel straps.

Changes in A 308 – 50 T (long term steel sheets) and further changes in A 93 – 50 T are being considered which will affect the finish, inspection, and rejection clauses of these specifications.

Changes in Methods A 90 – 39 and A 309 – 49 (weight of coating tests) are contemplated which will allow sampling of material from which full-size samples, as now outlined, cannot be obtained. Study of the problem of determining the weight of coating on narrow strip is under way.

Revisions are currently being balloted upon by the committee to eliminate the minimum length of lay requirement for 7, 19, and 37 wire strand in Specifications A 122 – 41 and A 218 – 41 for zinc-coated steel wire strand. It has been proposed that requirements for the "uniformity of coating" in these specifications be deleted.

A new specification for Zinc-Coated Overhead Ground Wire Strand has been prepared and will be balloted on for recommendation to the Society as an ASTM Tentative.

Standard Specifications for Zinc (Hot Galvanized) Coating on Structural Steel Shapes, Plates and Bars and Their Products (A 123), and Standard Specifications for Zinc Coating (Hot Dip) on Iron and Steel Hardware (A 153) are receiving study by the responsible subcommittee to clarify as to which specification should be used for items such as pole line hardware, light steel shapes, etc. At the present time difficulties arise because of uncertainty as to which specifications should be used as a basis of purchase for such items.

Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys

IN ORDER to undertake work on the super-strength alloys, Committee A-10 submitted to the Board of Directors, a revised scope which was approved May 6, 1952, which reads as follows:

"In general, Committee A-10 has jurisdiction over the classification, specification requirements, methods of test, questions of utility and related subjects pertaining to those iron-base and other chromium-bearing alloys termed 'stainless,' 'rustless,' or 'heat resistant,' whose primary characteristic is resistance to corrosive attack, elevated temperatures, or both."

In view of this enlargement of scope, Committee A-10 during the Annual Meeting established a new Sub-committee on Super-Strength Alloys, under the temporary chairmanship of H. D. Newell, Babcock & Wilcox Tube Co. A limited number of invitations were issued for this organization meeting to those people known to be interested in this field. Anyone interested in the work of this subcommittee and wishing to apply for membership should write either to Jerome Strauss, Chairman of Committee A-10, M. A. Cordovi, Secretary, or to H. D. Newell, Chairman *pro tem* of the new subcommittee.

A new Tentative Specification for Iron-Chromium and Iron-Chromium-Nickel Alloy Tubular Centrifugal Castings for General Applications has been approved by letter ballot of the committee and will be submitted to the Society through the Administrative Committee on Standards. Committee A-10 recommended at the Annual Meeting revisions in the Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service (A 269) and Standard Specifications for Seamless Austenitic Chromium-Nickel Steel Still Tubes for Refinery Service (A 271), deleting the reference to nitric acid passivation.

A second draft of a recommended practice for cleaning of stainless steel surfaces has been prepared, and it is hoped that any questions remaining may be resolved so that this proposed tentative can be submitted to the Society at the 1953 Annual Meeting.

Subcommittee VI on Metallography which has for several years been active in a study of the determination of sigma phase (by metallographic examination) through the use of various etching reagents has completed a number of round-robin tests and a comprehensive progress report will be presented with the 1953 report of A-10.

Other work in progress includes consideration of a proposed specification for stainless steel wire strand and the organization of a special subgroup to institute special tests in the Pittsburgh area to compare directly the performance of 17 per cent chromium steel and 18 per cent chromium -8 per cent nickel steel under conditions that will simulate exposure of these steels on certain buildings in which they have been used extensively in the city of Pittsburgh.

A question which has been raised several times in the past was again brought to the attention of the committee. That is the question of the use of the term "stainless steel" as compared with "corrosion-resistant steel." This matter is being referred to the various subcommittees for their comments.

Committee B-2 on Non-Ferrous Metals and Alloys

IN THE light of a ballot conducted in Subcommittee II on Refined Lead, Tin, Antimony, and Bismuth as to the advisability of issuing a proposed tentative specification for pig tin and by action of the Advisory Committee on Committee B-2, the proposed tentative will not be presented to the Society until the Advisory Committee gives further consideration to the question. It is the hope that the Tin Symposium sponsored by Committee B-2 and which was generally well received by the more than 125 members and visitors in attendance, may throw additional light on the desirability and subsequent acceptance of a specification for this particular material.

Three specifications for titanium were recommended for publication as tentative covering Iodide Titanium (B 266 – 52 T) Titanium Strip, Sheet, Plate, Bar, Tube, Rod, and Wire (B 265 – 52 T), and Titanium Ingot (B 264 – 52 T). Additional work is continuing including a proposed specification for titanium sponge.

Currently under way in the committee is work on specifications for nickel-molybdenum and nickel-molybdenum-chromium alloys of the Hastelloy type. Study is continuing on methods of test for continuity of coating in the Standard Specifications for Lead-Coated Copper Sheets (B 101). Work is also in progress on specifications for rosin-cored solder wire. Other new work includes the writing of requirements for nickel, inconel, and Hastelloy pipe size schedules 5, 10, 40, and 80 similar to the ASA 36.19 Specification for Stainless Steels. The committee has also revised a number of specifications with the thought of issuing three general requirement specifications. These general requirement specifications would be for (*a*) pipe and tubing, (*b*) sheet, strip, and plate, and (*c*) rods and bars.

Committee B-6 on Die-Cast Metals and Alloys

COMMITTEE B-6 on Die-Cast Metals and Alloys recommended to the Society that the B-7 code identification system be included for the following specifications:

- Aluminum-Base Alloy Die Castings (B 85 – 50 T)
- Zinc-Base Alloys in Ingot Form for Die Castings (B 240 – 49 T)
- Magnesium-Base Alloy Die Castings (B 94 – 49 T)
- Zinc-Base Alloy Die Castings (B 86 – 48)
- Lead- and Tin-Base Alloy Die Castings (B 102 – 48)
- Copper-Base (Brass) Alloy Die Castings (B 176 – 50)

In addition the committee recommended adoption of Specifications B 94 as standard.

The aluminum-base alloy die-casting specimens exposed at Sandy Hook, N. J., and New York in 1951 were recalled last year and the physical testing has now been completed. The magnesium and zinc-alloy test bars exposed at Key West, Fla., were moved to a new location in Key West. Tests on similar specimens exposed at Sandy Hook, N. J., have had to be discontinued. The Key West specimens are not scheduled for exposure until 1959. Additional atmospheric exposure tests will be made on the extra specimens prepared for this zinc and magnesium test program.

Increased demand by users of aluminum and magnesium casting for a guide in the selection of alloys for particular applications led to the establishment of an alloy recommendation committee by the American Foundrymen's Society. This committee has developed various tabular forms for ready presentation of data for sand, permanent mold, and die casting alloys. Committee B-7 is considering the advisability of including a similar tabulation in the Tentative Specifications for Aluminum Base Alloy Die Castings (B 85).

Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys

A TASK group of Subcommittee III on Salt Spray Tests has reported results of cooperative tests which confirm early indications as to the usefulness of the acetic acid-salt spray test for testing blistering tendencies of copper-nickel-chromium plate on zinc-base die castings. Tests now in progress indicate that the acetic acid modification will also be useful in studying copper-nickel-chromium deposits on steel. Studies have been made of the salt spray tests using 5 per cent as well as 20 per cent concentrations and temperatures of 95 and 120 F. Faster failures were obtained at the higher temperature and with the more concentrated solution. The task group is being enlarged to study the acetic acid modification of the salt spray tests on other materials for which the salt spray test is specified and to study the effect of varying concentration of acetic acid.

All the B-3 test specimens remaining at the various test sites were removed during the year and specimens will be subjected to the same tests as the earlier specimens; that is, tension tests, visual inspection, weighing, cleaning, and reweighing. One 9 by 12-in. plate will be kept for use in the analysis of corrosion products.

Calibration of the corrosivity of the atmosphere at several of the ASTM test sites is continuing through the periodic exposure and removal of zinc and steel specimens. A study of instruments for determination of atmospheric pollution indicates that several thousands of dollars would be necessary for the purchase of equipment. Other major expenses would be the cost of transporting the equipment from one site to another as it is indicated reliable data could be obtained only from observations of at least a weeks duration at each site and such observations should be made at least twice during the year.

The 10-yr specimens of stainless steel disk-type couples exposed in 1941 are to be removed, resistance measurements

made, and disks weighed. One set of the magnesium disk-type couples which have been on exposure for over two years will be removed from each test site. Resistance measurements will also be made on these couples and the disks will be weighed by the cooperators who did the original weighing before exposure.

The exposure of the magnesium spool-type couples, which constitute the second part of the original three-part program, was initiated about six months ago. One group of samples will be exposed for a total time of one year. During this same period three successive sets of samples are being exposed for four-month periods. The first four-month samples have been returned and the second four-month samples are now on exposure.

Committee B-7 on Light Metals and Alloys, Cast and Wrought

BEFORE the start of World War II, Committee B-7 on Light Metals and Alloys began planning for an extensive atmospheric exposure test program. The war suspended this activity and a post war analysis of the earlier program resulted in a greatly expanded program to include magnesium alloys as well as additional aluminum alloys. These years of waiting, planning, and collecting specimens are now at an end. Test specimens, numbering more than 1600 at each site, of 30 aluminum and 8 magnesium alloys, have been exposed at New York City, State College, Pa., and Kure Beach, N. C. Exposure at Point Reye, Calif., will be made within the next few months.

The committee presented three new tentatives at the Annual Meeting. One of these tentatives that will be particularly important and useful, not only to members of Committee B-7 but to other non-ferrous metals committees, is the Tentative Recommended Practice for Codification of Light Metals and Alloys, Cast and Wrought (B 272 – 52 T). The other two tentative specifications are for Aluminum and Aluminum Alloy Pipe and Tube for Pressure Vessel Applications (B 274—52 T) and Aluminum and Aluminum Alloy Bars, Rods, and Shapes for Pressure Vessel Applications (B 273 – 52 T).

New work of the committee includes the consideration of revisions in aluminum pipe specifications to include schedules 5 and 10 in the same manner as in ASA B 36.19 for Stainless Steel Pipe. The request for these revisions was made by the Chemical Industry Correlating Committee of the American Standards Assn. Several requests have been received requesting development of specifications for aluminum wire used for spray metallizing, and work is being initiated in this field. Present plans also call for the preparation of specifications for anodic coatings on aluminum during the coming year.

Committee C-1 on Cement

THE specifications for portland and masonry cements received special attention at the meeting of Committee C-1 on Cement held June 26. An additional recommendation was agreed upon, subject to letter ballot of the committee, for the advancement to standard of a tentative revision accepted in January of this year, which corrects Table II in the Standard Specifications for Portland Cement (C150) in respect to setting-time requirements. This action is necessary as a result of the withdrawal of the older version of the time of setting test method (C 191 – 49). The specification will now be governed by the new test method (C 191 – 51 T) in respect to the Vicat test. This change will make the requirements for time of setting identical with those of the Specifications for Air Entraining Portland Cement (C 175 T).

Much concern has been expressed recently over abnormal expansion as found in brick masonry walls using masonry cement. The committee has now recommended the inclusion of a 1 per cent expansion limit as measured by the autoclave test at 48 hr. This recommendation is in the form of a tentative revision of the Specification for Masonry Cement (C 91), and if the letter ballot is satisfactory, will be referred to the Administrative Committee on Standards for acceptance. An additional change in the masonry cement specification was accepted pertaining to a requirement that all bags be plainly marked with the type of cement contained therein. The Sponsoring Committee on Portland Cement is continuing its consideration of the proper air content of non-air-entraining cement. Dissatisfaction was expressed in respect to the present air content method, and a more suitable test procedure is felt desirable. The significance of fineness is under scrutiny, and further study is to be given to the need for more than one method of determination, as well as the feasibility of the substitution of a bleeding test.

The development of specifications for fly ash, as well as for fly ash portland cement, is approaching a final stage, and activity at present has been in the nature of joint consideration by the proper subcommittees of Committees C-1 and C-9, the latter committee being interested in fly ash for use as an admixture in concrete. The several working subcommittees reported progress, a few items of which are mentioned. In the study of the effect of various amounts of gypsum, the results of tests from 13 mills have now been circulated for subcommittee study. Progress in developing a bleeding test procedure has been made, involving the use of a mechanical mixer and vibration damper, with ten laboratories cooperating in round-robin testing. The results of the completed test program on determination of heat of hydration of portland cement, in which thirteen laboratories participated, have been circulated to the committee. It is expected that the proposed rapid method will be presented to the committee at its next meeting for adoption as an alternate procedure. Improvement in the precision of a time of set test method is still needed, as well as a better means of evaluating data. It is expected that further study of this property will be made on a joint basis with a subcommittee of Committee C-9. In the field of chemical analysis, two items were reported upon, namely, the need for further cooperative work on the development of a standard method for manganese removal and a review of cooperative tests from six laboratories on the use of the flame photometer method (C 228 – 49 T), in which preliminary tests indicate that the Beckman apparatus will give satisfactory results when using special adaptations.

The committee is making extensive plans for its 50th anniversary meeting in Philadelphia on October 30–31.

Committee C-3 on Chemical-Resistant Mortars

SEVERAL test methods are approaching the final stages of development in Committee C-3 on Chemical-Resistant Mortars, for determining various physical properties of these special types of mortars. It was reported at the meeting of the committee on June 25 that a proposed method for measuring bond strength will be completed within the next two months covering silicate and resinous cements. This method will be initially for information purposes only. A need was expressed for a test procedure for determining the bond strength of sulfur cement mortar. Final drafts of test methods for chemical resistance and for setting time are now being reviewed.

Committee C-4 on Clay Pipe

THE separation of test methods from all specifications for clay pipe and the grouping of them under a separate ASTM designation were approved by Committee C-4 on Clay Pipe at its meeting on June 24. A footnote was proposed for inclusion in the new tentative, indicating that it supersedes the test method procedures now published in the several specifications for clay pipe. The subject of flue linings received considerable discussion, and further attempts will be made to standardize conditions in this field, which vary considerably as to size of unit and construction practice throughout the country. Initially a proposed simplification of flue lining sizes will be prepared for publication as information only in the ASTM BULLETIN.

Committee C-7 on Lime

A COMPLETE revision of the Standard Specifications for Sand for Use in Plaster (C 35) was presented to Committee C-7 on Lime at its meeting on June 27, which will outline limitations for those aggregates most commonly used in interior plaster, including perlite, sand, and vermiculite. This revision is subject to letter ballot of the subcommittee and main committee, as well as for letter ballot of Committee C-11 on Gypsum, which has joint jurisdiction, and will revert the standard to tentative status. The committee has made further recommendations to Committee C-12 on Mortars for Unit Masonry in reference to the designation of types now used in the new Tentative Specification for Mortar for Unit Masonry

(C 270 – 50 T). Progress was reported on the development of specifications for lime as used in leather processing and for silica and sand-lime brick. Soundness of lime was stressed by retiring Chairman Voss, who urged that the committee prepare papers on durability of lime in order to encourage collection of data. In connection with the subject of soundness, it was suggested that the autoclave test, similar to that used for cement, be run on a seven-day basis, in testing hydraulic lime.

Committee C-9 on Concrete and Concrete Aggregates

COMMITTEE C-9, jointly with Committee C-1, on Cement have prepared a statement of policy for publication in the ASTM BULLETIN which will clearly present the position of the Society in reference to the evaluation and approval of air-entraining admixtures and additions. It is felt that publication of this statement will especially help in differentiating between an admixture and an addition.

A special subcommittee has been named to compile a complete new edition of the "Significance of Tests of Concrete and Concrete Aggregates," which was first published in 1935.

The reports of subcommittees, in general were in the nature of progress reports. Among the various items referred to in these reports were noted: cooperative work on two methods for measuring chemical reactivity in concrete aggregates; a proposed revision of a Method of Test for Coal and Lignite in Sand (C 123) which would refer to lightweight particles; a proposed specification for curing compounds; agreement on a satisfactory method for measuring bleeding in concrete; and a discussion on a cooperative series of tests for measuring abrasion of concrete, and from this, one method to be selected for further development. With the publication of three new tentative methods of freezing and thawing tests by the Society covering rapid freezing and thawing in water, rapid freezing in air and thawing in water, and slow freezing and thawing in water or brine, respectively, the subcommittee has now recommended for letter ballot of the committee a fourth procedure involving slow freezing in air and thawing in water.

Committee C-11 on Gypsum

A TESTING program for the determination of strength and mortar consistency of ready-mixed plasters was reviewed at the meeting of Committee C-11 on Gypsum held June 24. A performance standard on these properties will be studied by the proper subcommittee. The Standard Specifications for Sand for Use in Plaster (C 35) has been completely rewritten in order to bring it up to date, especially in respect to the recognition of various lightweight aggregates which are now in extensive use. This standard is under the joint jurisdiction of Committee C-7 on Lime and Committee C-12 and is being submitted to both committees for letter ballot. A further revision of the Standard Specification for Gypsum Sheathing Board (C 79) was recommended for letter ballot involving the addition of two notes, one which gives reference to the use of the Standard Methods of Testing Gypsum and Gypsum Products (C 26) for determining water resistance characteristics and the other indicating that gypsum sheathing in 4-ft widths is available in certain limited areas only.

Committee C-12 on Mortars for Unit Masonry

THE principal item of interest to members of Committee C-12 on Mortars for Unit Masonry was the revision of the new Tentative Specifications for Mortar for Unit Masonry (C 270 – 51 T). At its meeting on June 27, the committee approved a recommendation for a change in the proportions as set up for mortar types A-1 and A-2 found in Table II of the specification. These two types will now include proportions of portland and masonry cement and lime or lime putty. Final tests are being run by six cooperating laboratories to establish data needed for the preparation of a proposed method of test for efflorescence. In the field of research, the pointing of mortars has been under consideration with the development of proper specifications being considered as a necessary part of the final study.

D-18 on Soils for Engineering Purposes

SEVERAL test methods are being developed in Committee D-18 on Soils for Engineering Purposes as reported by the subcommittees at the committee meeting on June 27. In the study of physical characteristics, Subcommittee R-3 is still working on a proposed method for measuring moisture-density. Permeability of compacted soil is a physical property on which a proposed method has been studied by Subcommittee R-4. It is planned to hold a symposium on this subject in the next year or two for the purpose of obtaining more information. Structural properties have received considerable attention by Subcommittee R-5 through the holding of symposiums on both direct shear and triaxial shear. Standard test methods for both of these types of shear are either in the planning stage or have been developed for consideration. Techniques of chemical, physical, and mineralogical properties of soils will be studied by Subcommittee R-6, following its sponsorship of the current symposium on exchange phenomena, which was felt to be very successful in eliciting information and discussion. A test method for determining calcium chloride in soils is under preparation by Subcommittee R-8. A biography of papers that have been presented on the subject of dynamic properties was urged for publication by Subcommittee R-9, and a symposium is being considered. A symposium is being considered by Subcommittee R-10 on soil-bearing tests.

Committee D-19 on Industrial Water

AMONG the high lights of the Annual Meeting activities of Committee D-19 was the Symposium on Continuous Analysis of Industrial Water and Industrial Waste Water, sponsored by the committee.

The committee reported that the "Manual on Industrial Water" is now ready to be submitted to the Society for final editing and publication. A final draft of a Guide for the Administration and Operation of Committee D-19 on Industrial Water was approved by the committee and is being prepared for publication.

The Editorial Subcommittee reported on plans for cooperation by Committee D-19 in the development by Committee E-1 on Methods of Testing of general recommendations on the form of ASTM methods for chemical analysis.

The Subcommittee on Sampling reported that a revision of the Standard Methods of Sampling Industrial Water (D 510 – 49) to cover methods for securing samples for biological tests has been prepared. Committee D-19 plans to recommend to the Administrative Committee on Standards the reversion to tentative of Methods D 510 and incorporation of this revision. The Subcommittee also prepared, for publication as information only, the Proposed Method of Sampling Steam and Water at Subatmospheric Pressure.

The Subcommittee on Methods of Analysis reported the completion of a method for examination of water-formed deposits by chemical microscopy. This method has been approved by letter ballot of Committee D-19 and will be submitted to the Administrative Committee on Standards for publication as tentative. The subcommittee has also prepared methods of test for bromide and iodide, residual chlorine, nitrite, and hardness, which Committee D-19 expects to submit to the Administrative Committee on Standards during the coming year.

Among the numerous projects that are nearing completion by this subcommittee are two important round-robin tests: one is the evaluation of five methods for determination of dissolved oxygen, arrangements having been made to conduct this test at a central station power plant with the participants running each of the tests at the plant. The second round-robin test is the evaluation of proposed methods for chemical analysis of water-formed deposits by the distribution to the participants of prepared samples of deposits and making cooperative tests thereon. A new project authorized was the development of polarographic methods of analysis.

Committee D-19 presented to the Society an extensive revision of the Standard Method of Corrosivity Test of Industrial Water (USBM Embrittlement Detector Method) (D 807) that was prepared by the Subcommittee on Methods of Testing. This subcommittee reported progress in work on simulated service tests for corrosivity of industrial water, using tubular metallic products as specimens. A new project being undertaken is development of a nondestructive test for thickness of water-formed deposits in tubular products.

The Subcommittee on Water-Borne Industrial Waste reported completion of

methods for chemical oxygen demand, suspended solids, chlorine demand, oily matter, and sulfur compounds. The subcommittee also reported on preparation of a Suggested General System for Reporting Test Data on Industrial Waste Water, for publication as information only. A new project was authorized on methods of test for radioactive wastes in industrial water.

Committee E-2 on Emission Spectroscopy

COMMITTEE E-2 reported that some 50 suggested methods have now been submitted to the Society for publication and should soon be available in a compilation of methods on emission spectroscopy.

Of particular significance was the report that several proposed new and revised tentative methods should be ready for submittal to the Society during the coming year. After several years' work in collecting and studying methods in current use, Committee E-2 feels that it is now practicable to proceed with preparation of tentative methods. A proposed Tentative Method for Spectrochemical Analysis of Zinc and Zinc-Base Alloys by the D-C Arc-Solution Technique is now ready for submittal to the Administrative Committee on Standards. Several proposed tentative methods for analysis of lead, tin, and their alloys, and a method for analysis of aluminum are nearly completed.

Committee E-9 on Fatigue

THE "Articles on Fatigue" which were assembled through the cooperation of Committee E-9 on Fatigue, collated and reproduced by Battelle Memorial Institute and distributed by the ASTM were well received. This publication which was of a trial nature, had a sale of more than 150 copies. A new group of references for the year 1951 is currently being compiled and will be made available within a few months.

The Survey Subcommittee in 1950 summarized the replies to a general questionnaire send out by E-9 in an attempt to prepare a list of all fatigue projects and progress, and fatigue projects on which more information is desired. This summary has been brought up to date and this information will be appended to the E-9 Report as it appears in the 1952 *Proceedings*.

Interest in tests of large members has continued and ways and means of sponsoring a program of bending and torsion fatigue tests of large members is currently under consideration.

The committee has continued its practice of advising on fatigue papers proposed for the Annual Meeting and this year 15 papers were accepted on the committee's recommendation. Five of these papers composing the Eighth Session on "Fatigue with Emphasis on Statistical Approach" will be published as a Special Technical Publication.

ASTM-ASME Joint Committee on Effect of Temperature on the Properties of Metals

ONE of the gratifying reports at the meetings of this Joint Committee in New York was from the Finance Committee, indicating that close to $80,000 had been raised in its program to insure adequate underwriting of the various research projects under way or in course of development in the committee. The committee is appreciative of the fine support it has received from industry. All segments of industry have participated, including the foundry group, which is concerned with the research to be undertaken on the elevated-temperature properties of cast iron, in which Committee A-3 is cooperating.

At the panel meetings current work was reviewed. The Data and Publications Panel is undertaking a survey of relaxation test data, with the necessary monies allocated by the committee to cover the collection and correlation. The questionnaire to compile needed data on the elevated-temperature properties of copper-base alloys is virtually completed, and this will be mailed out in the early Fall. Another survey is to be started to provide data on the high-temperature strength of weldments.

It will be recalled in connection with this work of the Data and Publications Panel that the group decided it would be vastly preferable to issue data on selected groups of alloys and metals rather than to attempt an over-all compilation of data on all metals, as was done for the 1939 "Creep Data" volume. Thus far two widely distributed reports have been issued, the first "Strength of Wrought Steels at Elevated Temperatures" prepared by Messrs. Miller and Heger through the cooperation of the U. S. Steel Co.; the second "The Elevated-Temperature Properties of Stainless Steels" compiled after an extensive survey, by Messrs. Simmons and Cross of Battelle Memorial Inst.

The committee is sorry to lose from its ranks, because of a shift in his company responsibilities, Dr. R. P. Miller, who has headed the Data and Publications Panel and to whom much credit is due for the aggressive program of work already accomplished and under way.

The Low-Temperature Panel laid plans for a projected symposium to be held during the 1953 Annual Meeting in June in Atlantic City, which would deal largely with the low-temperature properties of metals.

Among the sponsored research projects under way are studies of the high-temperature properties of sheet materials at the University of Michigan, and at Battelle Institute a survey of high-temperature properties of chromium-molybdenum steels and the super alloys, and the determination of effect of notches on the fatigue properties of N 155 alloy. Several other research studies are being carried out in industry through the cooperative effort of the committee members.

Excerpts from the remarks of Dr. Albert Caquot at the President's Luncheon are given below. Dr. Caquot, President of the International Standardization Organization, spoke on behalf of the delegates from across the seas.

The ASTM has reached its half-century. Such an anniversary places a group of this importance in a period of its youth, and at the same time in the period of methodical and powerful development. . . .

The immensity of the activity going on in the USA has produced inevitably a spectacular development of well-organized, large industrial organizations, some of which often surpass the total production of a whole nation of medium size.

These specialized organizations which we find in all branches of the national economy, are so highly developed that they are in a position to make their own studies and design their own methods of test, thus rendering great services to their clients and through them to the whole American nation. It is they who have put in high relief the word and the idea of "standardization" and every one in this room has known from his childhood what benefit this brings to all. . . .

Effects of evolution are felt everywhere. They affect quality as well as quantity, and nothing in human activity is unchangeably crystallized. Thus, methods of test are also necessarily in a state of evolution. Therefore, the groups assuming the task of directing test methods must always be open to progress. Men, dedicated to this work, are fully aware of the difficulties of their task which in endless succession comes to an end and is born again. . . .

The ASTM has shown in the first 50 years of its history that it is well up to its important role. All of us wish to ASTM as well as to this great nation, the United States of America, a long period of prosperity.

Technical Minds Meet

Greetings Delivered to the American Society for Testing Materials at Its Fiftieth Anniversary Luncheon

By R. E. Zimmerman,

Formerly Vice-President, Research, United States Steel Co.

It is a pleasant privilege to bring greetings to the American Society for Testing Materials on the occasion of its Fiftieth Anniversary. This message is delivered on behalf of a hundred American scientific societies, trade associations, and departments of the Federal Government, including the Armed Services, whose representatives are present here today. While I do not have the inherent power to seize any of these organizations, I may at least speak for them in honoring a great and useful Society, with which they have been cooperatng for many fruitful years. The cooperation, I assure you, has been freely and gladly accorded, for all parties joining in this tribute have had points of common interest in the important work which the American Society for Testing Materials has been so faithfully prosecuting.

During the past fifty years, since the founding of the Society, life in the United States has changed from the relatively simple to the highly complex. The remarkable spurt in industrialization, which has been experienced since the turn of the century, has brought into play many new forces and activities, and has emphasized the need for the functioning of such an agency as the American Society for Testing Materials. Our list of products has been enlarged and diversified almost beyond measure. The techniques of mass production have been developed, calling for the uniformity and interchangeability of parts. Numerous raw materials, unknown or unused in earlier years, daily flow through hundreds of processes of manufacture. Moreover, the increasing adoption of the scientific approach to the problems of industry has injected degrees of refinement and exactness which prescribe reliance upon carefully determined chemical and physical properties.

How well could we be meeting our obligations to the public, to our constituents, and to our own operating organizations without the assistance constantly afforded by the American Society for Testing Materials? Not very well. Its activities have meant the difference between order and chaos in many aspects of the dealings between and among producers and consumers of goods. It has been the prime influence in the development of specifications for thousands of materials and products, thus playing the role of arbiter of quality, and administrator of agreement. Both public and private interests have had from the Society the hand of guidance, of enlightenment, and of protection. All of this means that the American Society for Testing Materials has been a tireless worker in the group which is paving the highway of progress in America.

Admittedly, the knowledge obtained by testing, and the standards built upon that knowledge, are two very important ingredients in our overall technical advancement. They are indispensable to orderly procedures in all fields of activity involving material things, and their influence reaches far beyond the realms of the physical. To be useful, testing must be conducted in the spirit of discovering "the truth, the whole truth, and nothing but the truth." That same principle applies with equal force to the formulation of specifications and standards based upon the truth so revealed. The creed of the ASTM embraces these ideas.

Happily for all concerned, the Society is a democratic institution, not a self-willed dictator, and employs democratic methods in arriving at its findings This is as it should be, in a country originally conceived and organized as an exponent of liberty, individual initiative, and private competitive business. In essence, the ASTM provides a mechanism by which the parties at interest on any subject, whoever they may be, may join forces and determine by a meeting of minds, or substantial concurrence, what is right, proper, and appropriate. Such a procedure brings to bear on each considered subject the knowledge and judgment of those who know whereof they speak—and the results are salutary.

The democratic processes employed by the American Society for Testing Materials of course cannot be absurdly democratic. Manifestly, it would be impossible for one hundred million adult members of our population to meet and discuss specifications which might be of interest to them. The technical societies, however, and the trade associations, departments of Government, and other groups which consistently collaborate with the ASTM and cooperate within its framework, provide the desired representation, which is widespread and well qualified. Hence, the representatives of the hundred-odd organizations who have come here today to compliment the Society upon its attainments, are actually bearing witness to the value of joint effort, to which they themselves, according to the word of ASTM, have contributed in important measure. During the course of many years of cooperative endeavor, there have been so many blood transfusions back and forth between the Society and its helpers, that differentiation of the blood types in all of them would be a matter of extreme difficulty. By these words we, the organizations mentioned, are not attempting to glorify ourselves, but rather to express our appreciation of the machinery furnished by the ASTM, to the end that our respective contributions on any item might be molded into a useful finished product.

Much has been accomplished in fifty years. The record of the ASTM bears ample testimony to thousands of jobs well done..... It is not time to fold up the tents. The ASTM will never have outlived its usefulness, nor will it come to the end of its chosen task. Specifications and standards, as well as methods of testing, must keep abreast of progress. Obsolescence and inadequacy are ever present challenges which must be met and effectively handled in the field of the Society. There will continue to be a call for revisions of the old and provisions for the new, as long as men continue to think, and are not frustrated by conditions which poison ambition and kill opportunity. In a dynamic economy, new methods of manufacture, new raw materials, and new products are constantly appearing on the scene. Then, too, an increasing population requires improved facilities, commensurate with its expanding needs. All of these matters bring additional projects to the Society, for the formulation of specifications.

So, the day of rest for the American Society for Testing Materials is a mirage, not an attainable reality. Its members, its supporting organizations, are traveling the same road of progress—and the pace is not becoming less rapid. At age fifty, the Society, free of anemia, arthritis, and coronary afflictions, is a well-trained youth, prepared to go ahead indefinitely. All of us, your friends, admirers, and helpers congratulate you upon a remarkable past, and bestow our blessings upon your promising future.

List of New and Revised Tentatives with Serial Designations

THE Society accepted at the Annual Meeting 68 new tentatives and revisions in 140 former tentative specifications and methods of test. Of the revised tentative specifications and methods 36 have been extensively revised and the titles are given below (marked with an asterisk) with the list of those issued by the Society for the first time. In addition, 12 standards have been revised and reverted to tentative status. Designations of technical committees responsible for the various items are indicated after the boldface materials headings.

Steel (A-1)

Specifications:

Alloy Steel Bars for Nitriding (A 355 – 52 T).
Heavy-Walled Carbon and Low Alloy Steel Castings for Steam Turbines (A 356 – 52 T).
5 per cent Chromium, 0.5 per cent Molybdenum Steel Plates for Boilers and Other Pressure Vessels (A 357 – 52 T).
Electric - Fusion - Welded Austenitic Chromium-Nickel Alloy Steel Pipe for High Temperature Service (A 358 – 52 T).
*Carbon and Alloy Steel Forgings for Rings for Reduction Gears (A 290 – 52 T).

Methods and Definitions:

Mechanical Testing of Structural Steel (A 359 – 52 T).

Cast Iron (A-3)

Specifications:

Chilled and White Iron Castings (A 360 – 52 T).

Corrosion of Iron and Steel (A-5)

Specifications:

1.25-oz. Ordered Coating (Pot Yield) Zinc-Coated (Galvanized) Iron or Steel Roofing Sheets (A 361 – 52 T).
*Zinc-Coated Sheets (A 93 – 52 T).

Wires for Electrical Conductors (B-1)

Specifications:

Zinc-Coated (Galvanized) Steel Core Wire (with Coatings Heavier than Standard Weight) for Aluminum Conductors, Steel Reinforced (ACSR) (B 261 – 52 T).
Three-Quarter Hard Aluminum Wire for Electrical Purposes (B 262 – 52 T).

Method:

Determination of Cross-Sectional Area of Stranded Conductors (B 263 – 52 T).

Non-ferrous Metals and Alloys (B-2)

Specifications:

Titanium Ingot (B 264 – 52 T).
Titanium Strip, Sheet, Plate, Bar, Tube, Rod, and Wire (B 265 – 52 T).
Iodide Titanium (B 266 – 52 T).

Electrical Heating, Resistance, and Related Alloys (B-4)

Specifications:

High-Resistivity, Low-Temperature Coefficient Wire (B 267 – 52 T).
Round Chromium-Copper Wire for Electronic Devices (B 268 – 52 T).

Methods:

Sag of Tungsten Wire (B 269 – 52 T).
Relative Thermionic Emissive Properties of Materials Used in Electron Tubes (B 270 – 52 T).

Copper and Copper Alloys, Cast and Wrought (B-5)

Specifications:

Copper-Base Alloy Centrifugal Castings (B 271 – 52 T).
Rectangular Copper Wire for General Purposes (B 272–52 T).

Light Metals and Alloys, Cast and Wrought (B-7)

Specifications:

Aluminum and Aluminum-Alloy Bars, Rods, and Shapes for Pressure Vessel Applications (B 273 – 52 T).
Aluminum and Aluminum-Alloy Pipe and Tube for Pressure Vessel Applications (B 274 – 52 T).
*Aluminum and Aluminum-Alloy Sheet and Plate for Use in Pressure Vessels (B 178 – 52 T).
*Aluminum Bars for Electrical Purposes (Bus Bars) (B 236 – 52 T).

Recommended Practice:

Codification of Light Metals and Alloys, Cast and Wrought (B 275–52 T).

Metal Powders and Metal Powder Products (B-9)

Recommended Practice:

Evaluating Microstructure of Apparent Porosity in Cemented Carbides (B 276 – 52 T).

Chemical-Resistant Mortars (C-3)

Specifications:

Sulfur Mortar (C 287 – 52 T).

Refractories (C-8)

Method:

Disintegration of Fireclay Refractories in an Atmosphere of Carbon Monoxide (C 288 – 52 T).

Concrete and Concrete Aggregates (C-9)

Methods:

Potential Reactivity of Aggregates (Chemical Method) (C 289 – 52 T).
Resistance of Concrete Specimens to Freezing and Thawing (C 290 – 52 T).
Flexural Strength of Concrete (Using a Simple beam with Center-Point Loading) (C 293 – 52 T).
*Fundamental Transverse and Torsional Frequencies of Concrete Specimens (C 215 – 52 T).
*Water Retention Efficiency of Liquid Membrane-Forming Compounds and Impermeable Sheet Materials for Curing Concrete (C 156 – 52 T).
*Volume Change of Cement Mortar and Concrete (C 157 – 52 T).
*Sampling Fresh Concrete (C 172 – 52 T).

Specifications:

*Concrete Aggregates (C 33 – 52 T).

Descriptive Nomenclature:

Constituents of Natural Mineral Aggregates (C 294 – 52 T).

Recommended Practice:

Petrographic Examination of Aggregates for Concrete (C 295 – 52 T).

Mortars for Unit Masonry (C-12)

Specifications:

*Aggregate for Masonry Mortar (C 144 – 52 T).

Thermal Insulating Materials (C-16)

Specifications:

* Mineral Wool Molded-Type Pipe Insulation for Elevated Temperatures (C 281 – 52 T).

Asbestos-Cement Products (C-17)

Specifications:

Asbestos-Cement Pressure Pipe (C 296 – 52 T).

Structural Sandwich Constructions (C-19)

Method:

Tension Test in Flatwise Plane of Sandwich Constructions (C 297 – 52 T).

Ceramic Whiteware (C-21)

Definitions:

*Terms Relating to Ceramic Whitewares (C 242 – 52 T).

Paint, Varnish, Lacquer, and Related Products (D-1)

Methods:

Common Properties of Certain Pigments (D 1208 – 52 T).
Color of Clear Liquids (Platinum-Cobalt Scale) (D 1209 – 52 T).
Fineness of Dispersion of Pigment-Vehicle Systems (D 1210 – 52 T).
Temperature-Change Resistance of Clear Nitro-Cellulose Lacquer Films Applied to Wood (D 1211 – 52 T).
Measurement of Wet Film Thickness of Paint, Varnish, Lacquer, and Related Products (D 1212 – 52 T).
Crushing Resistance of Glass Spheres (D 1213 - 52 T).
Sieve Analysis of Glass Spheres (D 1214 – 52 T).

Specifications:

*Industrial 90 Benzene (D 837 – 52 T).
* Industrial Grade Toluene (D 842 – 52 T).
* Industrial Grade Xylene (D 844 – 52 T).

Petroleum Products and Lubricants (D-2)

Definitions and Specifications:

Farm Tractor Fuels (D 1215 – 52 T).

Methods:

Analysis of Calcium and Barium Petroleum Sulfonates (D 1216 – 52 T).
Measurement of Density and Specific Gravity of Liquids to the Fifth Place (Bingham Pycnometer Method) (D 1217 – 52 T).
Measurement of Refractive Index and Refractive Dispersion of Hydrocarbon Liquids (D 1218 – 52 T).
Mercaptan Sulfur in Jet Fuels (Color Indicator Method) (D 1219 – 52 T).

Calibrating Liquid Containers, Section A-Upright Tanks (D 1220 – 52 T).
*Analysis of Oil-Soluble Sodium Petroleum Sulfonates (D 855 – 52 T).
*Reduced Pressure Distillation of Petroleum Products (D 1160 – 52 T).
*Existent Gum in Fuels by Jet Evaporation (D 381 – 52 T).
*Gravity of Petroleum and Its Products by Hydrometer (D 287 – 52 T).
* Neutralization Value (Acid and Base Numbers) by Potentiometric Titration (D 664 – 52 T).

Tables:

ASTM-IP Petroleum Measurement Tables (D 1250 – 52 T).

Gaseous Fuels (D-3)

Methods:

*Specific Gravity of Gaseous Fuels (D1070 – 52 T).

Road and Paving Materials (D-4)

Specifications:

Preformed Expansion Joint Fillers for Concrete (D 544 – 52 T).

Methods:

*Sampling Bituminous Materials (D 140 – 52 T).
* Specific Gravity of Road Oils, Road Tars, Asphalt Cements, and Soft Tar Pitches (D 70 – 52 T).
*Specific Gravity of Asphalts and Tar Pitches Sufficiently Solid to Be Handled in Fragments (D 71 – 52 T).
*Distillation of Tars and Tar Products (D 20 – 52 T).

Paper and Paper Products (D-6)

Methods:

Pinholes in Glassine and Other Greaseproof Papers (D 1221 – 52 T).
Contrast Gloss of Paper at 57.5 deg (D 1222 – 52 T).
Specular Gloss of Paper at 75 deg (D 1223 – 52 T).
Zinc and Cadmium in Paper (D 1224 – 52 T).
Flat Crush of Corrugated Paperboard (D 1225 – 52 T).
*Ply Adhesion of Paper (D 825 – 52 T).
Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry-Indicator Method (D 779 – 52 T).

Wood (D-7)

Methods:

*Evaluating the Properties of Fiber Building Boards (D 1037 – 52 T).
*Testing Veneer, Plywood, and Other Glued Veneer Constructions (D 805 – 52 T).

Specifications:

*Round Timber Piles (D 25 – 52 T).

Bituminous Waterproofing and Roofing Materials (D-8)

Specifications:

Asphalt Insulating Siding Surfaced with Mineral Granules (D 1226 – 52 T).
Asphalt-Base Emulsions for Use as Protective Coatings for Built-Up Roofs (D 1227 – 52 T).

Methods:

Testing Asphalt Insulating Siding Surfaced with Mineral Granules (D 1228 – 52 T).
*Sampling Bituminous Materials (D 140 – 52 T).

Electrical Insulating Materials (D-8)

Methods:

*Electrical Resistance of Insulating Materials (D 257 – 52 T).

Rubber and Rubber-Like Materials (D-11)

Methods:

Low-Temperature Compression Set of Vulcanized Elastomers (D 1229 – 52 T).
*Sample Preparation for Physical Testing of Rubber Products (D 15 – 52 T).

Textile Materials (D-13)

Methods:

Flammability of Clothing Textiles (D 1230 – 52 T).
Shrinkage in Laundering of Cotton Knit Fabrics (D 1231 – 52 T).
Shrinkage in Laundering of Rayon Knit Fabrics (D 1232 – 52 T).
Testing Twine (Bast and Leaf Fibers) (D 1233 – 52 T).
Sampling and Testing Staple Length of Wool in the Grease (D 1234 – 52 T).
*Small Amounts of Copper and Manganese in Textiles (D 377 – 52 T).
*Fastness of Colored Textiles to Light (D 506 – 52 T).
*Clean Wool Content of Wool in the Grease (D 584 – 52 T).

Tolerances:

Acetate Yarns (D 1235 – 52 T).
Nylon Yarns (D 1236 – 52 T).
Rayon Yarns (D 1237 – 52 T).

Definitions:

*Terms Relating to Textile Materials (D 123 – 52 T).

Recommended Practice:

*Interlaboratory Testing of Textile Materials (D 990 – 52 T).

Adhesives (D-14)

Definitions of Terms:

Relating to Adhesives (D 907 – 52 T).

Plastics (D-20)

Methods:

Measuring Flow of Thermoplastics by Extrusion Plastometer (D 1238 – 52 T).
Resistance of Plastic Films to Extraction by Chemicals (D 1239 – 52 T).

Specifications:

*Ethyl Cellulose Molding Compounds (D 787 – 52 T).

Methods of Testing (E-1)

Method:

Diamond Pyramid Hardness of Metallic Materials (E 92 – 52 T).

Hardness Conversion Table for:

Nickel and High Nickel Alloys (E 93 – 52).

This standard prepared by Committee E-1 on Methods of Testing was approved for submission to letter ballot of the Society for immediate adoption as standard. This new conversion table is a companion standard to the present standards E 33 – 42 and E 48 – 47).

New Standards and Revisions in Metals, Paint, and Rubber Fields

THE Administrative Committee on Standards at May and June meetings approved a number of new methods and revisions of existing tentative methods and specifications submitted by the ASTM Committees on Steel, Paint, and Rubber and by the joint AWS-ASTM Committee on Filler Metal.

Steel:

Committee A-1 on Steel submitted jointly with Committee A-2 on Wrought Iron revisions and reversion to tentative of Standard Specifications for Seamless Boiler Tubes (A 83) to provide for ladle and check analysis requirements to conform with all their other tubular specifications, and to delete all reference to lap-welded tubes which are no longer manufactured. Committee A-1 will now have sole jurisdiction of the specifications.

The Committee also submitted a revision of Tentative Method of Macroetch Testing and Inspection of Steel Forgings (A 137) to include, as an Appendix, photographic examples of the various types of defects.

Filler Metal:

Tentative Specifications for Copper and Copper-Alloy Welding Rods are jointly issued by the American Welding Society and ASTM to cover such rods for use with the oxyacetylene, carbon arc, and inert-gas arc (metal and carbon, nonconsumable electrode) welding processes. These complete the needs for specifications for filler metals used in welding copper and copper alloys.

Paint:

Committee D-1 on Paint proposed a Tentative Method of Test for Viscosity of Paints, Varnishes, and Lacquers by the Ford Viscosity Cup (D 1200) to meet the need for a standard method employing the Ford Cup which has been widely used for many years. The proposed method was prepared in cooperation with the Federation of Paint and Varnish Production Clubs and will become a joint method of that organization.

Tentative Specifications for Calcium Carbonate Pigments (D 1199) were recommended to provide the paint, varnish, and lacquer industry with specifications for calcium carbonate pigments, one of the most widely used pigmentary materials.

The Committee also proposed revision and reversion to tentative status of two standard methods—Test for Specific Gravity of Pigments (D 153), and Test for Mass Color and Tinting Strength of Color Pigments (D 387)—to bring these methods up to date by permitting the use of modern

apparatus and improved, comprehensive methods.

Rubber:

Committee D-11 on Rubber and Rubber-like Materials submitted Tentative Methods of Test for Adhesives for Brake Lining and Other Friction Materials to fill the need created by the widespread adoption of the use of adhesives instead of rivets for the application of automotive brake linings. This new practice has rendered proper evaluation of the adhesives and the techniques of application essential. The methods are classified as follows: (*a*) methods for evaluating the strength and permanence of bonds and (*b*) methods for measuring the shelf life of bonding cements, tapes, and adhesive film on coated brake linings. The first group of tests are those for bonding metal to metal and brake lining to metal; the second group for checking the physical properties of the bonding tapes and cements after shelf aging.

Also submitted by the Rubber Committee was a Tentative Method of Test for Resistance to Aging of Vulcanized Rubber by Measurement of Creep (D 1206). This test consists of subjecting loaded test specimens to elevated temperatures in a circulating air oven and measuring their elongations as a function of time. The committee felt that such a method had considerable merit and should be published for greater availability and standardization.

New Tentative Specifications for Rubber Insulating Gloves (D 120 – 52 T) used for protection of personnel from electrical shock while working on energized conductors and equipment recognizes three classes of gloves distinguished by their insulation levels as determined by proof test voltage tests. These specifications represent a complete reworking of Standard D 120 which the committee recommended be withdrawn.

A Tentative Recommended Practice for Classifying Elastomeric Compositions for Resilient Mountings (D 1207) was developed by Section I on Motor Mounts of SAE-ASTM Technical Committee on Automotive Rubber to aid automotive engineers in selecting compositions having the desired characteristics for particular applications. It describes the fundamental properties of basic compositions which may be useful in designing finished mountings.

Also recommended at the request of the joint SAE-ASTM Committee was reinstatement of the Tentative Method of Test for Low-Temperature Brittleness of Rubber and Rubber-like Materials (D 763). This test (commonly called Thiokol method), while inherently less accurate than D 746 is needed with silicone rubbers and is still in use for evaluation of brittleness characteristics as distinct from measurement of brittle temperature by D 746.

Several revisions of tentative methods were prepared by the Rubber Committee. Tentative Methods of Testing Compressed Asbestos Sheet Packing (D 733) was revised as to method of measuring thickness and tensile strength to comply with latest practice and incorporates by reference, Method D 1147 for compressibility and recovery.

Tentative Method of Test for Resistance of Vulcanized or Synthetic Elastomers to Crack Growth (D 813) was revised to bring the method up to date and make it more usable. Reproducibility of results is improved by use of a new and better piercing tool of the spear type.

Changes in details of operation of the test machine and addition of a note on temperature gradient and heat transfer constituted the revisions of Tentative Method of Test for Viscosity of Rubber and Rubber-like Materials by the Shearing Disk Viscometer (D 927).

Tentative Methods of Test for Mechanical Properties of Elastomeric Vulcanizates under Compressive or Shear Strains by the Mechanical Oscillograph (D 945) was revised in Section 9 to show the value of the constant in the formula for K_s to be 105 instead of 185, which, it was agreed, was incorrect.

Elimination of unnecessary provisions in the procedure for the compression set test comprised the revision of Tentative Specifications and Methods of Test for Latex Foam Rubbers.

Revisions of Tentative Specifications and Methods of Test for Sponge and Expanded Cellular Rubber Products (D 1056) provide for use of D 1171 Weather Resistance Exposure Test. They also eliminate an unnecessary provision in the procedure for the compression set test and change the length and width tolerances on sheet and strip given in the Appendix for guidance only.

Action by ASTM Administrative Committee on Standards, May-June, 1952

New Tentatives

Method of:

Test for Viscosity of Paints, Varnishes, and Lacquers by the Ford Viscosity Cup (D 1200 – 52 T)

Test for Adhesives for Brake Lining and Other Friction Materials (D 1205 – 52 T)

Test for Resistance to Aging of Vulcanized Rubber by Measurement of Creep (D 1206 – 52 T)

Specifications for:

Copper and Copper Alloy Welding Rods (B 259 – 52 T)

Calcium Carbonate Pigments (D 1199 – 52 T)

Rubber Insulating Gloves (D 120 – 52 T)

Recommended Practice for:

Classifying Elastomeric Compositions for Resilient Mountings (D 1207 – 52 T)

Reinstatement of Tentative

Method of:

Test for Low-Temperature Brittleness of Rubber and Rubber-like Materials (D 736 – 46 T)

Revisions of Tentatives

Method of:

Macroetch Testing and Inspection of Steel Forgings (A 317 – 52 T)

Testing Compressed Asbestos Sheet Packing (D 733 – 51 T)

Test for Resistance of Vulcanized Rubber or Synthetic Elastomers to Crack Growth (D 813 – 44 T)

Test for Viscosity of Rubber and Rubber-like Materials by the Shearing Disk Viscometer (D 927 – 49 T)

Test for Mechanical Properties of Elastomeric Vulcanizates under Compressive or Shear Strains by the Mechanical Oscillograph (D 945 – 49 T)

Specifications for:

Seamless Steel Boiler Tubes (A 83 – 52 T)

Insulated Wire and Cable: Class AO, 30 per cent Hevea Rubber Compound (D 27 – 50 T)

Insulated Wire and Cable: Heat-Resisting Synthetic Rubber Compound (D 754 – 50 T)

Insulated Wire and Cable: Performance Synthetic Rubber Compound (D 755 – 50 T)

Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications (D 735 – 51 T)

Latex Foam Rubbers (D 1055 – 49 T)

Sponge and Expanded Cellular Rubber Products (D 1056 – 51 T)

Concentrated, Ammonia Preserved, Creamed and Centrifuged Natural Rubber Latex (D 1076 – 49 T)

Reversion to Tentative

Methods of:

Test for Specific Gravity of Pigments (D 153 – 39)

Test for Mass Color and Tinting Strength of Color Pigments (D 387 – 36)

Specifications for:

Lap-Welded and Seamless Steel and Lap-Welded Iron Boiler Tubes (A 83 – 46)

Insulated Wire and Cable: Performance Rubber Compound (D 353 – 50)

Insulated Wire and Cable: Heat-Resisting Rubber Compound (D 469 – 50)

Withdrawals

Specifications for:

Electrical Gloves (D 120 – 40)

Discussions in ISO Committee 45 on Rubber led to revisions of Tentative Specifications and Methods of Test for Concentrated, Ammonia Preserved, Creamed and Centrifuged Natural Rubber Latex (D 1076) permitting use of metal weighing dishes in Total Solids determination, a change in the procedure for Total Alkalinity, reduction in the amount of KOH added in the determination of KOH number, and addition of a method for determination of pH.

Addition of a table covering high and low temperature-resisting compounds (silicones) now in use and clarification of the tests required by certain of the suffix letters constitute the main revisions of Test Specifications for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications (D 735).

The importance of making simultaneous changes in standards relating to insulated wire and cable led to revision of the existing tentatives and reversion to tentative of the present standards. Specifications D 353, Insulated Wire and Cable: Performance Rubber Compound, and D 469, Insulated Wire and Cable: Heat-Resisting Rubber Compound, were reverted to tentative status incorporating changes that include a new Section 3 on Conductors and changing Table I to cover cables with thermosetting sheaths. These same revisions were also made in Tentative Specifications for Insulated Wire and Cable: Class AO, 30 per cent Hevea Rubber Compound (D 27); Insulated Wire and Cable: Heat-Resisting Synthetic Rubber Compound (D 754); and Insulated Wire and Cable: Performance Synthetic Rubber Compound (D 755).

Emergency Alternate Provisions in Bar Steels Approved

On May 14, 1952, the Society's Administrative Committee on Standards approved issuance of emergency alternate provisions (pink slips) relating to boron and "TS" grades of steel in the following tentative specifications:

- Heat Treated Alloy-Steel Bars (A 286 – 52 T)
- Alloy-Steel Bars to End-Quench Hardenability Requirements (A 304 – 52 T)
- Hot-Rolled Alloy-Steel Bars (A 332 – 52 T)
- Cold-Finished Alloy-Steel Bars (A 331 – 50 T)

These emergency alternates are intended to supply the bar steel industry with readily purchasable boron and "TS" grades of steel which can be used in place of those grades which have been cut off due to critical material shortages. The boron and "TS" grades are listed with the standard grades which they may replace.

NBS Research in Hazards of Static Electricity

For many years the National Bureau of Standards has been consulted by other Government agencies on problems arising from the hazards associated with static electricity, and is at present enlarging its research and standardization program for establishing and evaluating methods of measurement and for determining the properties of materials and equipment used to reduce the hazard.

Specifications for conductive floors and other equipment depend on a determination of the safe limiting resistances between objects.

Tests to determine the actual safe upper limit of resistance show that voltages as high as 5000 v can be developed by getting up from a plastic covered chair. Oscillographic records, however, indicate that if the resistance between the person and the chair is less than 20 megohms, the voltages will not exceed 300 v, a figure less than the minimum sparking voltage in air and thus not hazardous.

The most serious hazards, possible ignition of flammable gases or dusts, can best be mitigated by reducing the flammability or eliminating exposure to the flammable agent. This also reduces the hazard from other sources of ignition, such as arcs from the normal operation of electric equipment or the presence of hot bodies in the hazardous area. These measures, when coupled with the exclusion from the area of materials such as plastics, wool, and rubber, which have high electrical resistivity and "generate" high electrostatic charges, are often sufficient to reduce the hazard to a negligible value. More elaborate methods of mitigation depend upon reuniting the charges as fast as they are separated in order to keep the voltage across the affected objects low. This can be accomplished by connecting stationary metallic objects to a common ground, by humidification, or by installing a conductive floor to provide electrical contact with the objects that move or rest upon it.

NBS Circular 143, "Static Electricity," which treats of these problems, can be obtained from the Superintendent of Documents, Washington, D. C., for 10 cents.

ERRATUM

Error in Tension Requirements for Naval Brass Rod, Bar, and Shapes (Spec. B 21–51 T)

The Tentative Specification for Naval Brass Rod, Bar, and Shapes (B 21 – 51 T) contains a typographical error in Table II covering tension requirements. All the yield strength and elongation requirements starting with the fifth line of the table, with the exception of the last line, should be raised one line to their proper position. Specification B 21 – 51 T appears on page 13 of the 1951 Supplement to the 1949 Book of ASTM Standards, Part 2, and page 62 of the February, 1952, edition of the special compilation, "ASTM Standards on Copper and Copper Alloys."

J. K. Rittenhouse Becomes Treasurer *Emeritus*

One of the pleasant surprises at the Annual Meeting, a surprise at least to the recipient and most of the members, was the presentation of a cash gift to the retired Treasurer, John K. Rittenhouse, and conferring on him the honorary title of Treasurer *Emeritus*. The honor accorded Mr. Rittenhouse by the Board of Directors was in recognition of his 43 years of service to ASTM—years of devoted and intensive effort in the Society's behalf.

In presenting a scroll in testimony of his new title, President Fuller at the Lecture Session, Wednesday afternoon, June 25, expressed the Society's appreciation to Mr. Rittenhouse and extended best wishes. Mr. Rittenhouse in his gracious response tendered his thanks, and noted what a tremendous growth there had been in the Society's work.

The Treasurer *Emeritus* was the first full-time employee of the Society, having been associated with the founder Secretary, Edgar Marburg, when the offices were at the University of Pennsylvania, and continuously with the late Executive Secretary C. L. Warwick.

The officers and members of the Society and the Staff were pleased to note how happy and well both Mr. and Mrs. Rittenhouse appeared to be at the meeting where they were guests of the Society. They are making their home with their son Gordon, at 202 Roosevelt Road, Rochester 18, N. Y.

Barrett Opens Broad-Scale Applications Research Laboratory

A new laboratory, specially designed to develop and test materials and processes used in the manufacture of plastics, rubber products, paints and varnishes, paper, laminates, insulating materials, and a wide range of other products was opened at Edgewater, N. J., on July 11, by Barrett Div., Allied Chemical & Dye Corp.

The laboratory will be known as the Shadyside Applications Research Laboratory, and will be in the charge of D. A. Rankin, Superintendent. Containing extensive testing and actual production equipment, including mills, presses, calenders, extruders, molding machines, and other special purpose facilities, the laboratory will enable technicians to develop, test, and evaluate, under simulated production conditions, materials used in the manufacture of plastics, paper, and other products.

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The Fiftieth Anniversary

THE Fiftieth Anniversary meeting is now history. But the meeting will be long remembered and its impact will be felt for years to come. The heavy attendance and the unusually large number of well-attended technical sessions, half again as many as customary, are a matter of record. These sessions were replete with papers and discussions that will constitute valuable additions to the technical literature. All told, the amount of material presented, if gathered in one commemorative volume, would comprise a tome of over 4000 pages. Many of the sessions were in the nature of symposiums and these and others will form the basis of Special Technical Publications. We shall look forward to having many 50th Anniversary volumes, in addition to the *Proceedings*, rather than a single commemorative book.

The Anniversary meeting will be remembered for many things. It will be remembered for its outstanding Lecturers—Norman L. Mochel as the first H. W. Gillett Memorial Lecturer (on "Man, Metals, and Power") and R. C. McMaster, the Marburg Lecturer (on "Non-Destructive Testing"). It will be remembered for a notable exhibit of testing apparatus. The work accomplished at the many meetings of its technical committees will be reflected in important recommendations on standards and other technical programs in years to come.

But it is the inspiration of the entire meeting that means most of all. The participation by many organizations, here and abroad, with the many messages of greeting and good will give assurance of the recognition and standing the Society has attained. Many of these stressed the important part the Society is playing in our present-day industry and economy. This recognition and these very letters of commendation fix a responsibility that cannot lightly be ignored but which rather will serve as an inspiration for the continuation and extension of the Society's endeavors.

All in all this 50th Anniversary Meeting recorded many accomplishments. Our members and committee members can take justifiable pride in their Society.

Schedule of ASTM Meetings

DATE	GROUP	PLACE
September 10–11	ASTM Sessions, Centennial of Engineering	Chicago, Ill.
September 11	C-8 on Refractories	French Lick, Ind.
October 16–17	D-10 on Shipping Containers	Chicago, Ill.
October 16–17	D-15 on Engine Anti-Freezes	New York, N. Y.
October 27–29	C-16 on Thermal Insulating Materials	Hot Springs, Va.
October 27–29	D-20 on Plastics	Boston, Mass.
October 28–29	C-9 on Concrete and Concrete Aggregates	Philadelphia, Pa
October 29–31	D-9 on Electrical Insulating Materials	Boston, Mass.
October 30–31	C-1 on Cement (50th Anniversary)	Philadelphia, Pa.
October 30	St. Louis District	St. Louis, Mo.
November 25	E-11 on Quality Control of Materials	Philadelphia, Pa.
1953		
January 26–28	D-19 on Industrial Water	St Louis, Mo.
February 3–5	A-1 on Steel	Birmingham, Ala.
March 2–6	ASTM SPRING MEETING	Detroit, Mich.
June 29–July 3	ASTM ANNUAL MEETING	Atlantic City, N. J.

Resources for Freedom

Report of the President's Materials Policy Commission

THE nation's press, both the daily papers and many of the leading business and technical journals, have noted in more or less detail the Report of the President's Materials Policy Commission, which group was headed by William S. Paley. This five-volume report deals with one of our country's most basic and pressing problems and it is aptly termed "Resources for Freedom."

Probably no group of individuals is so concerned with our supply of materials as are the ASTM members, and the Society as such has on many occasions undertaken important work involving accumulation of data on strategic or important materials and through its emergency standards and alternate provisions has had some effect along conservation lines.

Despite the intensity of interest in the subject we cannot hope in the space at our disposal to do more than direct our readers' attention to this report and suggest that every organization having a direct interest in materials may wish to procure the volumes from the Government Printing Office.

How authoritative are the information and data provided we as yet could not evaluate, but the volumes are well printed, seemingly well edited, profusely illustrated, and each volume has a detailed subject index.

Here is a breakdown of the volumes (total pages about 640; page size, $9\frac{1}{4}$ by $11\frac{3}{4}$ in.):

Volume I	Foundations for Growth & Security	$1.25
Volume II	The Outlook for Key Commodities	$1.50
Volume III	The Outlook for Energy Sources	$0.50
Volume IV	The Promise of Technology	$1.75
Volume V	Selected Reports to the Commission	$1.25

Orders can be transmitted to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Keep in mind the Printing Office requests payment with the order in cash, check, or money order.

50-Year Index to Technical Papers and Reports

NOT only will the imminent publication of the 50-Year Index to ASTM Technical Papers and Reports culminate many months of work on the part of the Staff, but it will meet a persistent demand that has grown steadily more intensive for a handy and complete listing of all of the papers and reports issued by the Society.

Beginning in 1912, and at approximately 5-year intervals thereafter, combined Indexes to the *Proceedings* were issued. The last of these appeared in 1940 and covered not only the *Proceedings* but several other sources where the papers and reports were being published. With the intervention of World War II and the fact that a number of the earlier Index volumes were no longer available, the Administrative Committee on Papers and Publications and the Directors decided to concentrate the work on issuing this 50-Year Index.

Many members of the Society, numerous technical libraries, and others have expressed an urgent need for the book and it is gratifying that the work will shortly be completed. Copies are expected from the printer about the middle of August. A work of this kind must be issued in as condensed a form as possible to facilitate reference and use, and on the other hand sufficient detail must be given so that the researcher, the librarian, or the materials technologist can get the necessary information. From numerous conferences and discussions and consultation with leading authorities concerned with indexing, there evolved a plan which it is believed provides an answer to most needs.

There are some innovations in this new Index. In contrast to the *Proceedings* or the earlier Index volumes, for example, the Author Index precedes the Subject Index and only in the Author Index are complete papers and reports given. This makes it possible to have the Subject Index appear in quite a condensed form, even though the subjects covered are very extensive in number. Extreme care was taken in indexing the thousands of papers and reports so that the searcher would almost certainly find most everything pertinent to his study.

The Index is being reproduced in photo-offset printing. It will aggregate between 400 and 500 pages, page size 6 by 9 in. While the list price has been set at $6, members can procure copies at $4.75 each. A special Member's Order Blank is being distributed to each member late in July by separate mail. Copies will be mailed just as soon as the printer finishes binding. It is hoped completed books will start appearing in September.

Needed: Part 2, Non-Ferrous Metals, 1949 Book of Standards

A CONTINUED heavy demand for Part 2, Non-Ferrous Metals, of the 1949 Book of Standards has virtually exhausted the edition. Since a number of the members may be willing to dispose of their copies so that the Society can fill some of the urgent orders, this article urges those who feel that they can do without their book for a few months pending the new 1952 edition to send them back to Headquarters. The Society will buy back copies of this Part at $4 each, it being assumed the book would be in reasonable condition for resale.

A similar plea for copies of Part 1, Ferrous Metals, 1949 Book of Standards, was made several months ago and the helpful cooperation of many members enabled us to fill a number of urgent needs. The demand for this Part, too, continues and copies will likewise be purchased at $4 each. In returning either Part 1 or Part 2, be sure the return address is on the package to enable identification. It is well, also, to advise that shipment is being made.

(1950 and 1951 Supplements are not needed.)

New ASTM Cement Compilation Now Available

THE eleventh edition of this publication gives in convenient form the ASTM standard specifications and test methods pertaining to cement. The standards were prepared by Committee C-1 on Cement, and with this edition the publication is brought up-to-date as of May, 1952.

In addition to the standards, there are included appendices covering the Manual of Cement Testing; an extensive list of Selected References on Portland Cement: Information on Analytical Balances and Weights; a paper on "The Principle of the Methoxyl Method for Determining Vinsol Resin in Portland Cement"; and the personnel of Committee C-1.

For many years the specifications and test methods issued by the Society have been used to govern the manufacture and purchase of much of the cement that has been produced in this country. While all these standards and tentative standards are published in other volumes issued by the Society and copies are available in separate form, there is no other source so convenient as this special compilation. It is of considerable utility to all who are concerned with these widely used and important engineering materials.

The serial designations of tests and specifications included are:

C 150	C 114	C 186	C 227
C 205	C 109	C 187	C 219
C 10	C 115	C 188	C 243
C 91	C 204	C 189	C 265
E 11	C 151	C 190	C 267
C 175	C 183	C 191	C 191
C 226	C 184	C 229	C 266
C 230	C 185	C 228	

Copies of the 260-page handbook, in heavy paper cover, can be obtained from ASTM Headquarters, 1916 Race St., Philadelphia, Pa. Prices: 1 to 9 copies, $2.50 per copy.

50th Anniversary of Committee C-1 on Cement

PLANS are under way for a big two-day meeting of Committee C-1 on Cement, which will mark the 50th birthday of the committee, on October 30 and 31 in Philadelphia, Pa., the place of the first meeting. The meetings will be held at the Bellevue-Stratford Hotel, and arrangements are under a special subcommittee headed by W. H. Klein, Dragon Cement Co. The September BULLETIN will carry a complete outline of the meeting.

ASTM Meeting as Part of Centennial of Engineering

THE ASTM is participating in the Centennial of Engineering to be held in Chicago in September and is arranging for meetings in connection with this Centennial. The Centennial convocation has been arranged over the dates September 3–13, in commemoration of the history of engineering in this country during the past 100 years. The American Society of Civil Engineers, the first engineering society to be organized in this country, is taking the lead in organizing the convocation, but there are 39 engineering organizations that are participating. Following the organization of the ASCE the need arose for similar organizations and societies in specific engineering fields which accounts for the various organizations that have been formed. Materials have always played a very important part in engineering and this is reflected in the organization of the ASTM 50 years ago.

The ASTM will sponsor two meetings, one a lecture by Vice-President Norman L. Mochel, Manager, Metallurgical Engineering, Westinghouse Electric Corp., who presented the first H. W. Gillette Memorial Lecture at the recent Annual Meeting. The title of his Chicago lecture is "Men, Materials, and the Power Industry—a Trio in Action." The second is a Session on Wood which is one of five comprising a Symposium on One Hundred Years of Engineering Progress with Wood, under the joint auspices of the American Railway Engineering Association, the ASTM, the ASCE Structural Div., and the ASME Wood Industries Div.

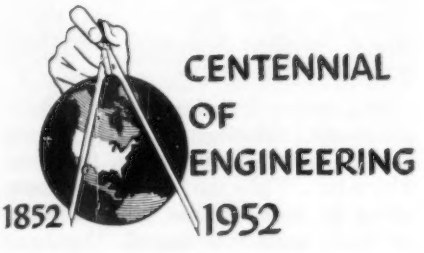
The headquarters of the Society will be in the Hotel Sherman and the Bal Tabarin Room has been reserved for the meetings. A block of sleeping rooms has been reserved at the Hotel Sherman for the use of ASTM members.

The Centennial convocation has the dual purpose of explaining contributions by engineering to the nation's growth and of providing a program of broad technical appeal.

Technical Program

The comprehensive technical program consisting of a number of symposiums sponsored by the various groups is now being assembled. The lecture by Mr. Mochel will be held on Wednesday morning, September 10, at 10 a.m.

Just 50 years ago when ASTM was being incorporated as a national technical society the prime movers making possible our great central stations of today came into being. This whole activity has had a remarkable growth. Many technical problems in materials have been met and overcome. But demands continue. Management wants and needs more efficiency. The materials engineer is in the thick of these problems. Mr. Mochel will cover some of the related factors of men and materials and their problems, and the power industry. This whole field, and its amazing past (as well as future) is a startling example of engineering progress. His Chicago lecture is based somewhat on the technical content of the outstanding first Gillett Lecture he presented in New York in June, but is greatly expanded, with a different emphasis and approach. Those who missed his New York lecture will want to be present in Chicago, and because of the great amount of additional material and the different slant of this lecture those who were privileged to hear him in New York should plan to attend this September 10 session. Past-President Harold H. Morgan, Vice-President and Chief Engineer, Robert W. Hunt Co., will preside at this session.



The Session on Wood, sponsored by the ASTM, will be held on Thursday morning, September 11, at 9:15 a.m., at which the following papers will be presented:

- Wood as an Engineering Material—L. J. Markwardt, Asst. Director, U. S. Forest Products Laboratory
- Basic Principles of Structural Grading—Lyman W. Wood, Engineer, U. S. Forest Products Laboratory
- Working Stresses for Structural Lumber—R. P. A. Johnson, Chief, Division of Timber Mechanics, U. S. Forest Products Laboratory
- Commercial Lumber Grades—Frank J. Hanrahan, Chief Engineer, National Lumber Manufacturers' Association
- Principles of Glued Laminated Lumber Design—A. D. Freas, Engineer, U. S. Forest Products Laboratory

Past-President L. J. Markwardt will preside at this session. The other sessions on wood will be held on Thursday afternoon and evening, September 11, and Friday morning and afternoon, September 12.

Centennial Day

Since September 10 has been designated as Centennial Day the features will be a centennial luncheon award ceremony in the afternoon and the centennial dinner in the evening. It is

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Hotel Sherman,
Earl R. Benedict, Convention Manager,
Chicago 1, Illinois

Please reserve for me during the Centennial of Engineering in Chicago, Illinois, the following:

Single (Approximate rate $.....) _____
Double (Approximate rate $.....) _____
Twin-Bedded (Approximate rate $.....) _____

for the following dates:

Arriving: _____
Leaving: _____

I am a member or committee member of ASTM.

Name: _____
Street Address: _____
City: _____ State: _____

expected that the dinner will be addressed by Herbert Hoover and Charles F. Kettering. Tickets for the luncheon and dinner may be secured at the central headquarters of the Centennial, 57th St. and South Shore Drive, Chicago 31, Ill.

Exhibits and Trips

One of the features of the Centennial will be an exhibit in the East Court of the Museum of Science and Industry. The exhibit will introduce the story of 100 years of progress through engineering and will be participated in by a number of the leading organizations in the country. Trips to various places of interest will be available, largely concentrated in the two Saturdays of the Centennial period. A program of ladies entertainment is also being arranged.

Hotel Reservations

The sleeping rooms have been reserved by the Sherman Hotel at the following rates:

Single Rooms: $4.95, $5.95, $6.95, $7.95, $8.95, 9.95
Double Bedrooms for Two Persons: $7.95, $8.95, $9.95, $10.95, $11.95 $12.95, $13.95
Twin-Bedded Rooms: $10.95, $11.95, $12.95, $13.95, $14.95

Kindly make reservations early, using the attached blank or a facsimile for the purpose.

Air Force Prepares Compilation of ASTM Specimens and Tests for Standards

A MOST interesting compilation of standard specimens and testing procedures of ASTM has recently been prepared by the Materials Testing Laboratory of the U. S. Air Force Institute of Technology at Wright-Patterson Air Force Base, Dayton, Ohio.

This Institute offers an engineering program for Air Force officers, and the purpose of the compilation of ASTM standards tests is to cover the practical aspects in connection with use of the Materials Testing Laboratory.

The manual is of particular interest because it gives in compact form clear-cut drawings of test specimens required for a wide cross-section of materials. While the information is in abridged form, it impresses us as a very commendable publication which would give men in the Air Force a clear conception of various specimens required, and do it with a minimum amount of space, an important factor in the interest of time conservation.

New Government Procurement Policy Hailed at ASA Meeting

THOMAS D. JOLLY, Vice-President in Charge of Engineering and Purchases, Aluminum Company of America, stated in an address to a Company Member Conference of the American Standards Assn. in Norfolk that the Government's recently announced policy of using the standards of private industry in its buying instead of writing its own specifications, can save American industry and the American people millions of dollars and countless hours of wasted motion. He called it possibly the most important forward step the Government has ever taken in standards work.

Mr. Jolly, who is a past-president of ASA, quoted a new Federal directive, produced jointly by the Munitions Board and the Federal Standards Branch as reading: "Nationally recognized industry and technical society standards and specifications shall be used to the maximum extent practicable in the development of Federal and military specifications and standards." This means, in layman's terms, that the government will no longer write its own specifications for such articles of common use as chairs, pencils, and photographic equipment, but will now accept the standards of qualified manufacturers.

This step was hailed by Mr. Jolly as an almost complete reversal in attitude by the Federal agencies. He expressed the belief that the American public does not realize how big and complicated the problem of military procurement is, or how much good work has been accomplished toward remedying bad purchasing practices. Specifically he praised the progress made in a Federal Catalog System which will identify its 2,500,000th item sometime in July. The catalog of articles of military use will probably be completed in 1953 and the civilian catalog in 1954 or 1955.

Standardization of purchases, not centralization, Mr. Jolly believes, is the answer to the Government's procurement problems. An adequate Federal Supply Catalog, he feels, will help make such standardization possible.

IT'S YOUR ASTM—HELP IT GROW!

1952 is a good year to invite someone to join the Society because:

1. **It is our 50th Anniversary year.**
2. **The value of membership is at an all-time high—more publications, more data coming through.**
3. **Every week emphasizes the desirability, and in fact almost the necessity of keeping in close touch with latest information on a wide range of materials, particularly with respect to evaluation of their properties.**
4. **ASTM Standards, termed by current members the backbone of industrial production, and a daily aid, should be "a first in the files of every industrialist."**
5. **Our Membership Committee will be very appreciative if our members who have done so much in previous years will be particularly alert this year.**

Sustaining Memberships Total 266

ELEVEN transfers to Sustaining Membership have been authorized since June 1. Companies recently making this transfer are as follows:

AMERICAN CHEMICAL PAINT CO., F. P. Spruance, Vice-President
AMERICAN PHENOLIC CORP., H. M. Neben, Chief, Electrical Testing Lab.
CATALIN CORPORATION OF AMERICA, J. B. Hyman, Chief Chemist
CLEVELAND TWIST DRILL CO., J. V. Emmons, Director of Laboratories
ERIE RAILROAD CO., Earl D. Hall, Engineer of Tests and Chief Chemist
B. F. GOODRICH CHEMICAL CO., R. J. Wolf, Manager, Sales Development Lab.
GRANITE CITY STEEL CO., F. G. White, Technical Director
HANSON-VAN WINKLE-MUNNING CO., M. B. Diggin, Chief Chemist
LEHIGH PORTLAND CEMENT CO., W. J. McCoy, Director of Research
LUMMUS CO., E. J. Vanderman, Metallurgical Engineer
ROHM & HAAS CO., Willard F. Bartoe, Physicist

These companies have been members of the Society for many years, and most have been very active through their technical representatives in the Society's activities; also, several of the representatives have served on various district councils.

The Sustaining Membership class, through the annual dues of $150, is an important means of maintaining the Society's financial structure on a satisfactory basis. It offers many special publication privileges, for example, an extra complete set of the Book of ASTM Standards may be requested, as well as a copy of all ASTM publications, many of which are normally available only on purchase. A booklet describing Sustaining Membership will be sent to any organization interested.

DISTRICT ACTIVITIES

District Officers and Councilors

ASTM members and committee members have elected new Councilors and officers for their respective Districts in accordance with the ASTM Charter for Districts which has been in effect since 1947.

Under the provisions of this charter terms of about one-half the Councilors of each District expire in June and officers' terms expire in the even-numbered years. The names of all council members, the hold-overs as well as those shown below, will be in the 1952 Year Book, now in preparation.

District meetings for the Fall are now in the planning stage and members should watch the BULLETIN for dates and topics of these meetings. When plans are definite, members and committee members in the District will receive direct-mail notices. It is usually customary to invite other technical men of the area concerned with the subject under discussion, to attend these meetings.

Names of the **new or re-elected Councilors** who will hold office until June, 1954, are listed below. **Please note that this is not a complete list of District Councilors but shows only those newly elected or re-elected (marked with an asterisk) this year.**

LIST OF NEW AND RE-ELECTED DISTRICT OFFICERS AND COUNCILORS AS OF JUNE, 1952

(Councilors whose terms carried through 1953 are not included in this list. For complete list, see 1952 Year Book now in preparation.)

Chicago

Chairman: J. E. Ott, Acme Steel Co., 2834 Archer Ave., Chicago 8, Ill.
Vice-Chairman: W. L. Bowler, The Pure Oil Co., 35 E. Wacker Drive, Chicago 1, Ill.
Secretary: D. D. Rubek, Anderson-Prichard Oil Corp., 3921 N. Ravenswood Ave., Chicago 13, Ill.
Councilors: C. E. Ambelang, Public Service Co. of Northern Illinois; B. J. Barmack, Commonwealth Edison Co.; W. L. Bowler, The Pure Oil Co.; E. E. Chapman, Atchison, Topeka & Sante Fe Railway; H. B. Emerson, Lehigh Portland Cement Co.; J. G. Heiland,* Bell & Howell Co.; J. T. Jarman, Allis-Chalmers Mfg. Co.; J. J. Kanter, Crane Co.; J. de N. Macomb, Consulting Engineer; V. C. Mehlenbacher, Swift & Co.; C. A. Menzel, Portland Cement Assn.; H. H. Morgan, Robert W. Hunt Co.; C. W. Muhlenbruch,* Northwestern Technological Institute; J. E. Ott, Acme Steel Co.; D. D. Rubek, Anderson-Prichard Oil Corp.

Cleveland

Chairman: R. T. Bayless, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.
Vice-Chairman: H. P. Ferguson, Standard Oil Co. (Ohio), Midland Building, Cleveland, 15, Ohio.
Secretary: L. F. Herron, The James H. Herron Co., 1360 W. Third St., Cleveland 13, Ohio.
Councilors: J. S. Adelson, Republic Steel Corp.; R. T. Bayless, American Society for Metals; C. O. Burgess,* Gray Iron Founders' Society, Inc.; A. W. Carpenter, The B. F. Goodrich Co.; H. W. Dell, The Glidden Co.; J. V. Emmons, The Cleveland Twist Drill Co.; H. P. Ferguson, Standard Oil Co. (Ohio); L. F. Herron, The James H. Herron Co.; E. G. Kimmich, The Goodyear Tire & Rubber Co.; Joseph Prescott, The Cleveland Electric Illuminating Co.; G. R. Rawson,* American Steel & Wire Div., United States Steel Co.; W. S. Scott* Republic Steel Corp.; F. G. Steinebach, Penton Publishing Co.; J. J. Vreeland,* Chase Brass & Copper Co., Inc.; J. F. Weigel,* Medusa Portland Cement Co.; R. L. Wilson, Timken Roller Bearing Co.; F. J. Wolfe,* National Carbon Div., Union Carbide & Carbon Corp.; George Yearley, True Temper Corp.

Detroit

Chairman: D. M. McCutcheon, Ford Motor Co., 3674 Schaefer Rd., Dearborn, Mich.
Vice-Chairman: A. J. Herzig, Climax Molybdenum Co. of Michigan, Inc., 14410 Woodrow Wilson Ave., Detroit, Mich.
Secretary: C. O. Durbin, Chrysler Corp., 12800 Oakland Ave., Detroit, Mich. For mail: Route 1, Walled Lake, Mich.
Councilors: V. A. Crosby,* Climax Molybdenum Co. of Michigan, Inc.; C. O. Durbin, Chrysler Corp.; C. H. Fellows, The Detroit Edison Co.; C. M. Gambrill, Ethyl Corp.; A. J. Herzig, Climax Molybdenum Co. of Michigan, Inc.; L. J. Jacobi,* The Detroit Edison Co.; D. M. McCutcheon, Ford Motor Co.; J. D. Ryan,* Libbey-Owens-Ford Glass Co.; R. B. Saltonstall, The Udylite Corp.; C. A. Siebert, University of Michigan; F. J. Walls,* The International Nickel Co., Inc.

New England

Chairman: H. H. Lester, Watertown Arsenal Laboratory, Watertown 72, Mass.
Vice-Chairman: C. G. Lutts, Boston Naval Shipyard, Bldg. 34, Boston 29, Mass.
Secretary: R. W. Chadbourn, Boston Edison Co., 1165 Massachusetts Ave., Boston 25, Mass.
Councilors: H. J. Ball, Lowell Textile Institute; J. H. Bly,* Pratt & Whitney Aircraft Div., United Aircraft Corp.; R. W. Chadbourn, Boston Edison Co.; R. C. Corson, Associated Factory Mutual Fire Insurance Cos.; M. N. Clair, The Tompson and Lichtner Co.; Daniel Cushing, Consulting Metallurgical Engineer; A. G. H. Dietz, Massachusetts Institute of Technology; E. A. Gramstorff, Northeastern University; W. J. Hamburger,* Fabric Research Laboratories, Inc.; H. H. Lester, Watertown Arsenal Laboratory; C. G. Lutts, Boston Naval Shipyard; R. P. Mahan,* Baird Associates.

New York

Chairman: G. O. Hiers, Consultant, 21 Coventry Rd., Baldwin, N. Y.
Vice-Chairman: S. R. Doner, Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Box 419, Passaic, N. J.
Vice-Chairman: E. P Pitman, Port of New York Authority, New York 11, N. Y.
Secretary: A. A. Jones, Anaconda Wire and Cable Co., Hastings-on-Hudson, N. Y.
Councilors: O. P. Beckwith,* Alexander Smith, Inc.; R. H. Bell,* Lucius Pitkin, Inc.; W. C. Bowden, Jr.,* Ledoux & Co., Inc.; Robert Burns,* Bell Telephone Laboratories; W. F. Collins, New York Central System; W. T. Cruse, Society of the Plastics Industry; M. P. Davis, Office of Price Stabilization; S. R. Doner, Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc.; Ephraim Freedman, R. H. Macy & Co., Inc.; G. O. Hiers, Consultant; A. A. Jones, Anaconda Wire and Cable Co.; E. P. Pitman, Port of New York Authority; Jerome Strauss, Vanadium Corp. of America; E. R. Thomas, Consolidated Edison Co. of New York, Inc.; Gordon Thompson, Electrical Testing Laboratories, Inc.; J. R. Townsend, Bell Telephone Laboratories; J. S. Vanick, The International Nickel Co., Inc.; R. M. Wilhelm, Miller and Weber.

Northern California

Chairman: P. V. Garin, Southern Pacific Co., 65 Market St., San Francisco 5, Calif.
Vice-Chairman: H. P. Hoopes, Pabco Products, Inc., Emeryville 8, Calif.
Secretary: P. E. McCoy, American Bitumuls & Asphalt Co., 200 Bush St., San Francisco, Calif.
Councilors: F. S. Cook, Robert W. Hunt Co.; H. de Bussiers, Curtis and Tompkins, Ltd.; Theo. P. Dresser, Jr., Abbot A. Hanks, Inc.; Dozier Finley, Pabco Products, Inc.; P. V. Garin, Southern Pacific Co.; H. P. Hoopes, Pabco Products, Inc.; P. E. McCoy, American Bitumuls & Asphalt Co.; L. A. O'Leary, W. P. Fuller and Co.; M. C. Poulsen, Port Costa Brick Works; Carey Ramey, Standard Oil Co. of California; F. C. Smith, Bethlehem Pacific Coast Steel Corp.

Ohio Valley

Chairman: J. C. Pitzer, The Formica Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.
Vice-Chairman: R. S. Armstrong, Standard Oil Co., Lima Refinery, Lima, Ohio.
Secretary: Archibald Hurtgen, Henry Vogt Machine Co., 10th & Ormsby Sts., Louisville 10, Ky.
Councilors: R. S. Armstrong, Standard Oil Co.; J. W. Bolten, The Lunkenheimer Co.; J. H. Calbeck, American Zinc Sales Co.; H. B. Currens, Lilly Varnish Co.; A. W. F. Green,* Allison Div., General Motors Plant 2; J. C. Harris, Monsanto Chemical Co.; Archibald Hurtgen, Henry Vogt Machine Co.; R. L. Kenyon,* Armco Steel Corp.; R. P. Koehring,* Moraine Products Div., General Motors Corp.; B. P. Mulcahy,* Fuel Research Laboratory, Inc.; H. C. Nutting, H. C. Nutting Co.; J. C. Pitzer, The Formica Co.; H. C. Schwalbe, Mead Corp.; F. C. Smith, Tube Turns, Inc.

Philadelphia

Chairman: E. K. Spring, Henry Disston & Sons, Inc., Unruh and Milnor Sts., Philadelphia 35, Pa.

Vice-Chairman: Tinius Olsen, 2nd, Tinius Olsen Testing Machine Co., Easton Rd., Willow Grove, Pa.

Secretary: L. D. Betz, W. H. & L. D. Betz, Gillingham & Worth Sts., Philadelphia 24, Pa.

Councilors: E. J. Albert, Thwing-Albert Instrument Co.; L. D. Betz, W. H. & L. D. Betz; T. H. Briggs,* Burroughs Adding Machine Co.; H. A. Dambly,* Philadelphia Electric Co.; Henry Grinsfelder, Rohm and Haas Co.; E. O. Hausmann, Continental-Diamond Fibre Co.; C. W. MacGregor,* University of Pennsylvania; G. H. Mains, National Vulcanized Fibre Co.; L. P. Mains,* Drexel Institute of Technology; W. J. McCoy,* Lehigh Portland Cement Co.; Tinius Olsen, 2nd, Tinius Olsen Testing Machine Co.; A. O. Schaefer, The Midvale Co.; E. K. Spring, Henry Disston & Sons, Inc.; H. W. Stuart, U. S. Pipe & Foundry Co.; F. G. Tatnall, Baldwin-Lima-Hamilton Corp.; J. V. Vogdes, Jr., Engineer

Pittsburgh

Chairman: M. D. Baker, West Penn Power Co., Box 146, Springdale, Pa.

Vice-Chairman: C. J. Livingstone, Gulf Oil Corp., Box 2038, Pittsburgh 30, Pa.

Secretary: H. F. Hebley, Pittsburgh Consolidation Coal Co., 2048 Koppers Bldg., Pittsburgh, Pa.

Councilors: M. D. Baker, West Penn Power Co.; H. A. Ball,* Ball Chemical Co.; S. A. Braley, Pittsburgh Steel Co.; W. S. Debenham,* United States Steel Co.; L. L. Ferrall, Crucible Steel Co. of America; H. F. Hebley, Pittsburgh Consolidation Coal Co.; C. J. Livingstone, Gulf Oil Corp.; F. T. Mavis, Carnegie Institute of Technology; Vic Sanders, Pittsburgh Corning Corp.; C. H. Sawyer,* Eastern Gas and Fuel Associates; Mary E. Warga, University of Pittsburgh.

St. Louis

Chairman: S. B. Roberts, Robert W. Hunt Co., 2008 Olive St., St. Louis 3, Mo.

Vice-Chairman: J. M. Wendling, City of St. Louis, Municipal Testing Lab., 55 Municipal Courts Bldg., St. Louis 3, Mo.

Secretary: W. C. Magruder, Carter Carburetor Co., 2840 N. Spring St., St. Louis 7, Mo.

Councilors: J. J. Brouk* Precast Slab and Tile Co.; A. W. Brust, Washington University; E. H. Harvey, Jr.,* Moloney Electric Co.; L. C. Hewitt, Laclede-Christy Co.; H. M. Hoffmeister,* Missouri Pacific Lines; W. C. Magruder, Carter Carburetor Co.; F. F. Ogden, Monsanto Chemical Co.; S. B. Roberts, Robert W. Hunt Co.; J. R. Romig,* Missouri Portland Cement Co.; H. W. Russell, Illinois State Division of Highways, Bureau of Materials; A. F. Schwarz, Jr., Russell, Mullgardt & Schwarz; E. J. Sheppard, National Lead Co.; J. M. Wendling, City of St. Louis, Municipal Testing Lab.; H. E. Wiedemann, Consulting Chemist.

Southern California

Chairman: E. O. Bergmann, C. F. Braun and Co., Alhambra, Calif.

Vice-Chairman: J. B. Morey, The International Nickel Co., Inc., 538 Petroleum Bldg., Los Angeles 15, Calif.

Secretary: M. B. Niesley, California Testing Labs., Inc., 619 E. Washington Blvd., Los Angeles 15, Calif.

Councilors: E. O. Bergman, C. F. Braun and Co.; F. J. Converse, California Institute of Technology; John Delmonte, Consulting Engineer; C. E. Emmons, The Texas Co.; W. C. Hanna, California Portland Cement Co.; J. B. Morey, The International Nickel Co., Inc.; M. B. Niesley, California Testing Labs., Inc.; R. B. Stringfield, Consulting Chemical Engineer; Bruce Wiker,* Los Angeles County Road Department; J. T. Young, City of Los Angeles Bureau of Standards.

Washington, D. C.

Chairman: E. F. Kelley, Bureau of Public Roads, Federal Works Agency, Washington 25, D. C.

Vice-Chairman: Fred Burggraf, Highway Research Board, National Research Council, Washington 25, D. C.

Secretary: J. R. Dwyer, National Bureau of Standards, Washington 25, D. C.

Councilors: R. C. Brand, Martinsburg, W. Va.; Fred Burggraf, Highway Research Board, National Research Council; J. R. Dwyer, National Bureau of Standards; M. H. Hall,* Olga Coal Co.; L. K. Hyde,* O. S. Peters Co.; E. F. Kelley, Bureau of Public Roads, Federal Works Agency; G. H. Kimber,* The Calcium Chloride Assn.; R. A. Marr, Jr., Virginia Military Institute; L. A. Palmer,* Bureau of Yards and Docks, Navy Department; H. C. Plummer,* Structural Clay Products Institute; Thomas Pringle,* U. S. Engineers; F. W. Reinhart,* National Bureau of Standards; Gerald Reinsmith,* Office Chief of Ordnance, U. S. Department of the Army; E. M. Schoenborn,* North Carolina State College; R. W. Seniff,* The Baltimore & Ohio Railroad Co.; G. G. Sward,* National Paint, Varnish and Lacquer Association; A. W. Van Heuckeroth,* Corps of Engineers, Engineer Research and Development Lab.; R. K. Witt,* Johns Hopkins University.

Western New York-Ontario

Chairman: Joseph Gentile, Pittsburgh Testing Laboratory, 257 Franklin St., Buffalo 2, N. Y.

Vice-Chairman: Louis Shnidman, Rochester Gas & Electric Corp., 89 East Ave., Rochester 4, N. Y.

Vice-Chairman: G. J. Gaukroger, The McKinnon Industries, Ltd., St. Catharines, Ont., Canada.

Secretary: F. A. Webber, Wickwire Spencer Steel Div., The Colorado Fuel and Iron Corp., Station B, Buffalo 7, N. Y.

Councilors: H. A. Campbell,* Bell Aircraft Corp.; F. B. Diana,* Z. Wagman & Son, Ltd.; L. V. Foster, Bausch and Lomb Optical Co.; G. J. Gaukroger, The McKinnon Industries, Ltd.; Joseph Gentile, Pittsburgh Testing Laboratory; W. H. Koch,* Mathieson Chemical Corp.; Clarence Lamoreaux, Federal Portland Cement Co.; F. L. Marsh, National Gypsum Co.; K. S. Masters,* City of Buffalo; T. L. Mayer, Buffalo Public Library; R. W. Morgan,* Fedders-Quigan Corp.; C. L. Pope, Eastman Kodak Co.; I. M. Schultz,* Harrison Radiator Div., General Motors Corp.; Louis Shnidman, Rochester Gas & Electric Corp.; F. A. Webber, Wickwire Spencer Steel Div., The Colorado Fuel and Iron Corp.

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* Newly elected councilors. Councilors elected for one-year term only.

"Power from the Atom" Discussed at Large Spring Meeting of Detroit District

On April 28, 1952, over 300 members and guests of the Detroit District of ASTM assembled in the Rackham Memorial Building Banquet Hall for dinner preceding an evening presentation based on the subject "Power from the Atom."

At the close of the short meeting, the President of the Society, T. S. Fuller, presented an entertaining and informative outline of the present status of the Society, its growth, and its plans for the immediate future.

At the conclusion of Mr. Fuller's remarks, the group adjourned to the building auditorium where approximately 250 additional members and guests had assembled. In the foyer of the auditorium the Richland Library Exhibit from the American Museum of Atomic Energy was on display. This exhibit consists of twelve panels approximately 4 by 6 ft, and gives a picture story of the development of the basic atomic reactions and, in addition, two scale models—one of a pile, and the other of an atomic power station. Also in the foyer was a large display panel describing atomic power exhibited by the Westinghouse Electric Corp. These exhibits received much attention and study from a large number of individuals attending the meeting.

Following opening remarks by Chairman Fraser and President Fuller, Walker L. Cisler, President and General Manager of the Detroit Edison Co. of Detroit, introduced the subject that was to be discussed during the evening, "Power from the Atom" and presented to the audience four panel members who would carry on the discussion of the subject. Mr. Cisler has been associated with the Atomic Energy Commission, National Security Resources Board, and the Mutual Security Agency in connection with the Marshall Plan.

The U. S. Atomic Energy Commission has authorized groups of industrial firms to study the feasibility of developing and operating nuclear reactors for the production of plutonium and for the generation of steam for power. One of these groups is comprised of the Detroit Edison Co. and the Dow Chemical Co. Mr. Cisler explained that the work of this group was still in the early stages of development but that it would not be long before full answers to atomic power production would be available. He then introduced E. L. Nugent of the Detroit Edison Co. who developed the subject of basic atomic reactions including nuclear fission. Mr. Nugent in turn introduced A. P. Donnell who was on loan from the Vitro Corp. of New York for aiding in the development of atomic power work. Mr. Donnell discussed for the group the development of atomic furnaces and reactor design. A. W. Hanson of the Dow Chemical Co., Midland, Mich., continued with a report on radiation and waste disposal as it per-

tained to residual products from atomic power plants. Finally A. H. Wagner of the Detroit Edison Co. outlined the economics related to the use of atomic power; he used a specific plant for the development of cost figures and drew conclusions which indicated that at the present time nuclear energy-generated power could not compete with that generated from coal-burning equipment.

At the conclusion of the panel discussion, numerous questions from the floor were answered by the panel members.

It was interesting to note audience reaction at this meeting. Very few individuals left the auditorium prior to the asking of the last question indicating, the full acceptance of the subject by a diversified group in an area predominantly associated with the automobile industry.

The committees responsible for the development of this successful meeting were the Program Committee under the chairmanship of A. J. Herzig, Climax Molybdenum Co. of Michigan; the Committee on Arrangements under C. O. Durbin, Chrysler Corp.; and the Publicity Committee headed by Robert Sergeson, Rotary Electric Steel Co.

Knock Rating Instrumentation

By Josiah French[1]

THE ASTM Motor (D 357) and Research (D 908) Methods for the Determination of Knock Characteristics of Motor Fuels have, since their inception used the bouncing pin to pick up and indicate through a hot-wire ammeter, the degree of fuel detonation in the ASTM-CFR single-cylinder test engine. In 1948 an electronic detonation indicating instrument now known as Detonation Meter, models 501 and 501A and developed by the Phillips Petroleum Co., was accepted as an alternate for the bouncing pin in both Motor and Research Methods.

With 4-year service background proving the electronic detonation meter far more reliable, convenient, accurate, and time saving than the bouncing pin, it is the intention of ASTM to eliminate the latter from Methods D 357 and D 908 on June 30, 1953, if the supply situation so permits.

In the four years the electronic detonation meter has been in use, its advantages over the bouncing pin have become more and more apparent. As indicated in Fig. 1, the bouncing pin is a mechanical instrument depending on machined surfaces, bushing clearances, and spring adjustments to give proper interpretation of detonation pressure waves. Spring adjustments control, to a certain extent, the detonation response of test fuels in relation to reference fuels, and consequently affect their octane number rating.

In contrast to the bouncing pin, the detonation meter, shown in Fig. 2, has no moving parts and no adjustment that can change the relative rating of test fuels. If the test unit does not rate ASTM check fuels correctly, the engine operator knows, after several simple checks on the detonation meter, that the difficulty lies in the engine or its accessories. When using the bouncing pin and encountering rating difficulties, the normal procedure is to try different spring adjustments to bring ratings into line. This procedure is frequently successful on the particular type of check fuel used, but when chemically different types of fuel are rated, the results may prove to be erroneous. The result of distorting bouncing pin response to compensate for engine malfunctioning, for example, a paraffinic type fuel will usually cause erroneous ratings of predominately naphthenic or aromatic type fuels. Regardless of the type fuel used to standardize and check bouncing pin adjustments and engine condition, there is a chance that other types of fuel will not be rated correctly.

When the detonation meter is used to indicate the degree of detonation, it leaves only the engine as a variable in responding to the fuel's tendency to knock. Pressure changes in the combustion chamber are picked up by a magnetostriction type element which is screwed into the pick-up opening in the engine cylinder head. The pickup generates a voltage which is proportional to the rate-of-change of pressure in the combustion chamber. This voltage is amplified, put through a threshold amplifier, again amplified, and then fed to a vacuum tube voltmeter which uses the

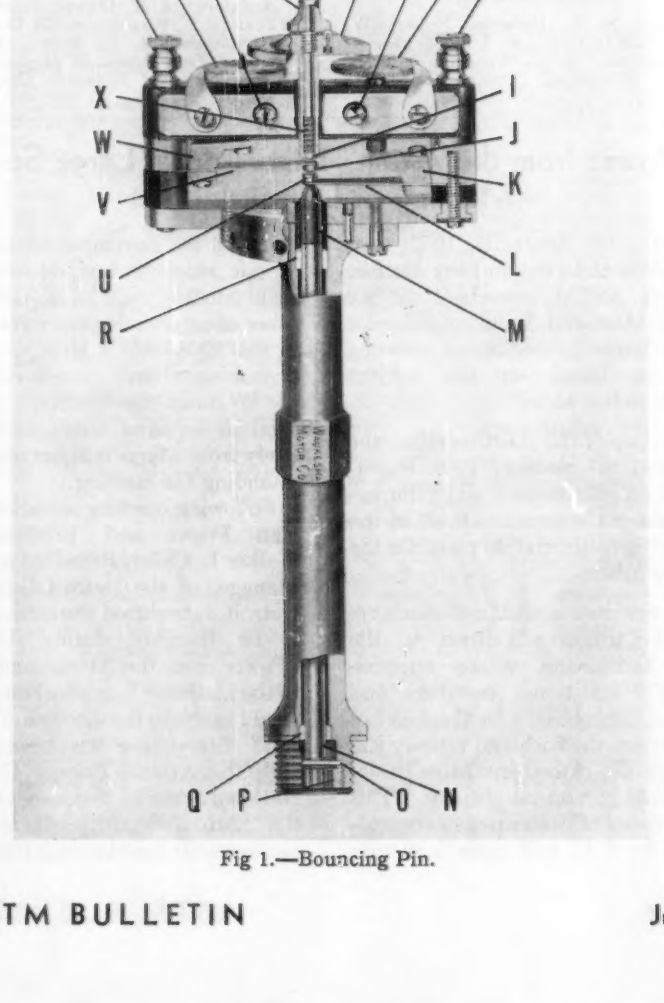


Fig 1.—Bouncing Pin.

[1] Gulf Oil Corp., Philadelphia, Pa.

knockmeter supplied with the engine. Controls are included to set knockmeter reading for standard knock intensity and to adjust meter spread, which is the meter reading difference between reference fuels differing by 2 octane numbers. A 6-point time constant switch is included to vary meter response and stability.

Laboratory tests made by members of Section A (Exchange Testing) and Section C (Instrumentation) of Research Division I, ASTM Committee D-2, using both the bouncing pin and detonation meter and covering a wide variety of fuels, show that there is no significant difference in ratings obtained with the two types of instruments.[2] Because of the uncertainty of bouncing pin adjustments, there is always doubt that the occasional minor differences encountered between the two instruments are real, or whether they are the effect of bouncing pin distortion.

[2] J. E. Taylor, "Summary Report on Investigation of the Detonation Meter, Model 501," Report of Committee D-2 Appendix VIII, *Proceedings*, Am. Soc. Testing Mats., Vol. 48, (1948).

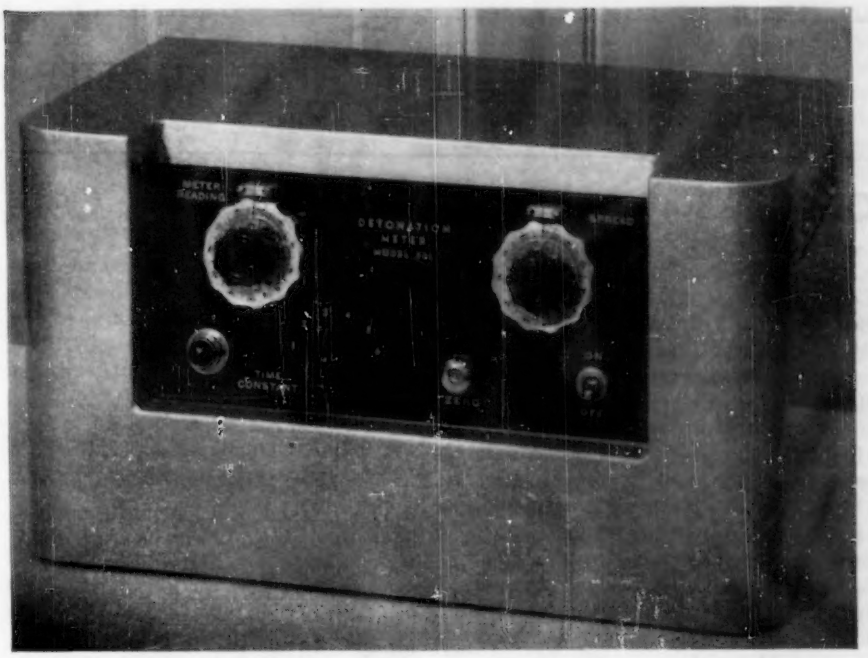


Fig 2.—Detonation Meter, Model 501.

The Analytical Section of the International Union of Pure and Applied Chemistry

AT THE close of the September, 1951, meeting of the International Union of Pure and Applied Chemistry in New York, the Analytical Section officially came into being. After a period of some four years of effort, originating at the London meeting in 1947, punctuated by meetings in Amsterdam in 1949 and at Graz in 1950, a provisional Section Committee formed at Amsterdam worked with the Paris headquarters of the Union, and formulated Rules for the Section. These were submitted to the Section membership and adopted at New York. At the same time the existence of Sections within the Union became official. It is interesting to analytical chemists to know that their Section meeting in New York was the first official Section meeting under Union auspices.

The Analytical Section is composed of a Section Committee, a group of Commissions working on problems of general interest to analytical chemists and Subcommissions working under Commission auspices. The officers of the Section, elected at the meeting in New York are: President C. J. van Nieuwenburg (Delft), 1951–1953, Vice-President I. M. Kolthoff (Minneapolis), 1951–1953, Vice-President P. E. Wenger (Geneva), 1951–1955, and Secretary S. E. Q. Ashley (Pittsfield), 1951–1955. They constitute the Executive Committee. Mr. Ashley, who is very active in ASTM work may be addressed at 100 Woodlawn Ave., Pittsfield, Mass.

Directory of The Refractories Institute to Use ASTM Standards

AN INTERESTING use of ASTM standards is to be made in a new directory of the Refractories Industry. This involves a listing of the class or quality of each product by the ASTM classification, or the use of other terms. The Technical Advisory Committee of The Refractories Institute is strongly recommending the use of the ASTM method. Full details concerning the preparation of the desired material are given in a statement available from the Institute. The following excerpt is from the explanatory material:

"The committee realizes that each producer will wish to make his own choice in expressing the quality of his products, either by the ASTM classification or by the use of other terms also, but strongly recommends the use of the ASTM method where it is applicable. This plan would enable those who are now using ASTM classifications in the trade to use them also in the Directory. Others may wish to have their products evaluated according to ASTM standards so as to use that method of listing in the Directory.

"Because there is a definite need in the trade for an extended use of expressions and descriptive terms that have been standardized, the Foreword of the Directory will contain a note explaining the terminology used, as well as abstracts of ASTM standards."

The following news release issued by the Institute relates directly to the new Product Directory:

The Refractories Institute, a national trade association to promote the interests of manufacturers and consumers of refractory products, is undertaking to compile and publish for wide distribution a Product Directory of Refractory Manufacturers in the United States.

The last edition of such a directory was in 1942 and there have been many company and product changes since that time.

The 1952 edition will include, for the first time, a section devoted to the optional product classification by ASTM standards or by the manufacturer's designation of the quality of his product. ASTM classification is the modern method based on properties of the material widely recognized and understood by manufacturers and consumers alike. We trust that all manufacturers will classify their products according to ASTM standards wherever possible.

The Directory will include also the names and office addresses of all refractory manufacturers, plant locations, brand names of products, and divisions of the refractories industry.

Such a directory is invaluable to consumers and manufacturers, federal, state and municipal governments, technical libraries, and others. A questionnaire and set of instructions have been mailed to all known refractory manufacturers by the Institute. Every manufacturer will be accorded equal treatment in the Directory, regardless of membership in the Institute. Every cooperating manufacturer will receive a copy on completion, without charge.

If any manufacturer has failed to receive a copy of the questionnaire and instructions, it is requested that he communicate with The Refractories Institute, First National Bank Building, Pittsburgh 22, Pa.

TECHNICAL COMMITTEE NOTES

Committee B-4 Holds Two-Day Meeting in Atlantic City

THE Spring meeting of Committee B-4 on Electrical Heating, Resistance, and Related Alloys, held in Atlantic City on June 5 and 6, was highlighted by an address on transistors by R. M. Ryder, Bell Telephone Laboratories, and a paper by Else and Ragnar Holm, Stackpole Carbon Co., "Fundamentals of the Welding of Electrical Contacts Under Heavy Current Conditions," the former presented at the meeting of Subcommittee VIII on Metallic Materials for Radio Tubes and Incandescent Lamps and the latter at the meeting of Subcommittee X on Contact Materials.

Committee work has resulted in recommendations to the Society for approval of four new tentatives:

Tentative Method of Test for:

Relative Thermionic Emissive Properties of Materials Used in Electron Tubes

Sag of Tungsten Wire

Tentative Specifications for:

High-Resistivity, Low-Temperature Coefficient Wire

Round Chromium-Copper Wire for Electronic Devices

The methods for chemical analysis for cathode nickel have been approved by Committee B-4 and are currently being submitted to letter ballot of Committee E-3 on Chemical Analysis of Metals. In addition to these new tentatives, revisions in B 82 and B 83 (nickel-chromium, and nickel-chromium-iron electrical heating elements, respectively) and B 84, temperature resistance constants of precision resistors wire, are also being submitted.

A new tentative, Recommended Practice for Means of Testing Sublimation of Cathode Materials, is currently out to letter ballot of the committees for subsequent submission to the Administrative Committee on Standards. Work is also under way on the development of a standards triode and specifications for clad materials used specifically for wire and strip stock tube components.

The test for hardness of contact materials, developed by Subcommittee X, has been approved by Committee E-1 on Methods of Testing and is currently out to letter ballot of Committee B-4.

In addition to the standardization work of the committee, revision and consolidation of the 1943 Bibliography on Electrical Contact Materials and its subsequent supplements is under way for publication in the Fall. Later this year a new edition of the B-4 compilation will be printed, bringing the 1948 edition up to date.

Concrete Pipe Committee Holds May Meeting in Chicago

Low head pressure concrete pipe specifications and a recommended practice for laying and backfilling concrete pipe were the two most current subjects for discussion at the May meeting of Committee C-13 on Concrete Pipe in Chicago, Ill.

The consensus was that the presently proposed specification for low head pressure concrete pipe was too general in nature and was referred back to the special subcommittee to revise and prepare as a specification for reinforced concrete low head pressure sewer pipe, it being felt that there were special requirements in the sewerage field which would not apply to other uses. The subcommittee was also instructed to consider specifications for other types of reinforced concrete pressure pipe.

The proposed recommended practice for laying and backfilling concrete pipe, very comprehensive in nature, was considered to be too extensive for a single ASTM standard. It was felt that the entire subject was broad enough to consider as joint projects with other associations interested in the use of pipe for sanitary and drainage purposes. The committee agreed on a proposal for a joint committee with the American Association of State Highway Officials, whose scope would be to develop a recommended practice for laying concrete culvert pipe. Similar action was taken for the development of a recommended practice for laying concrete sewer pipe as a joint project with the American Public Works Assn.

Reports of the several special subcommittees authorized at the December, 1950, meeting of the committee were presented and discussed at considerable length over the two-day session. Brief mention is made of these various items concerning principally revisions and further refinements of existing ASTM specifications and test methods on concrete pipe. Additional data are needed on the employment of hard rubber strips and sand-filled hose in the 3-edge bearing test method before the existing tentative revisions can be advanced to standard. The report of the Sub-committee on Long Range Planning indicated that more basic information is required before recommendations can be presented on fundamental revisions in the present specifications and test methods. It was agreed to continue this subcommittee with the specific function of handling all interim matters between meetings and to assist in the preparation of the agenda for meetings.

As a result of the meeting of the special subcommittee with a committee of the American Association of State Highway Officials, several recommendations were presented to the committee dealing principally with details of determining such physical properties as strength and absorption. Tentative revisions were accepted covering the addition of core tests as an alternative to the use of prepared concrete cylinders; a revision in the absorption test covering immersion and reweighing details; the elimination of grading requirements for aggregates as now required in addition to quality; the addition of a new section in the specifications to allow two lift holes for handling and laying purposes; the addition of a provision to allow a 24-hr soaking period, if necessary, in the hydrostatic test procedure; and marking of the top and bottom of concrete pipe using elliptical reinforcing in process of manufacture on both inside and outside.

A development of a specification for extra strength nonreinforced concrete pipe is authorized, it being felt desirable to have such as pecification to correspond with similar clay pipe. The committee took action to recommend to the Society for immediate adoption the revision of Standard Specifications for Reinforced Concrete Sewer Pipe (C 75) and Standard Specifications for Reinforced Concrete Culvert Pipe (C 76), which will replace the present section concerning wire reinforcement to include welded steel wire fabric. The present tentative revisions covering the use of cement and aggregates were also recommended for advancement to standard.

Wide Range of Standards Work by D-21 on Wax Polishes

THE determination of free alkali in wax products is considered to have no significance in establishing the quality of wax products, and Committee D-21 on Wax Polishes and Related Materials has gone on record to that effect, thus suggesting the elimination of this requirement in all specifications.

The two-day June meeting of the committee in Boston, Mass., brought forth many indications of definite progress in the development of standards ranging from raw materials to simulated service tests on the finished products.

A review of the reports of the subcommittees indicates the general progress being made throughout the committee. Two definitions of basic terms "wax" and "wax products" were approved. In raw materials, several existing ASTM methods were approved as being satisfactory for use with the materials covered by the committee including methods for determining chemical analysis of borax, analysis of industrial water, shellac, and several physical and chemical test methods on synthetic resins. Several new test methods are being developed including a method for hydrocarbon content in waxes, a procedure for concentrating wax, and for determining refractive index. It is planned to publish these new procedures for information before adoption as ASTM tentative methods.

Several task groups are working on chemical and physical test methods. The latest revision of the ASTM Method for Determination of the pH of Aqueous Solutions with the Glass Electrode (E 70 – 46T) was endorsed for committee use, and several new tentative methods were recommended for adoption including the determination of kinematic viscosity, total solids, total ash and silica, and sediment by use of a centrifuge. The present methods for determining flash point such as the Tag closed and open tester and Cleveland open cup were indicated as being unsatisfactory for testing the flash point on wax products, and a new task group has been authorized to study a suitable method.

The continued interest in performance tests was evidenced by the attendance at the meetings of that subcommittee and its three sections on slip resistance, service life, and application. The results of a round-robin test series among ten laboratories, using three test methods, namely, the Underwriters, the Sigler, and field tests, indicated definite progress. The two machines involved, however, cannot be used on a comparative basis. Further refinement in apparatus and technique has been made, and proposed test methods will now be prepared for these machines, which will be published by the Society for information purposes. In determining means of measuring service life or wear, preliminary tests have been made by three laboratories on a water spotting determination, and further tests will be continued. The Sward hardness machine, which determines relative hardness by use of a rocker on a glass plate, has been used, but poor correlation has been shown to date on absolute values. It is now planned to calibrate four Sward testing machines and to have tests run at the National Bureau of Standards on one source of wax using the same personnel. The Fisher-Payne dip method has been studied by the section on application with no definite conclusions drawn. Study will be given to measuring the film thickness by test procedures used on paper.

Much has been accomplished by the Subcommittee on Specifications in its preliminary studies on requirements which should be in a specification for general-purpose industrial water-emulsion floor wax. The subcommittee reviewed various physical and chemical properties, application characteristics, and service life factors for their significance and inclusion in a specification. The subcommittee has agreed that specifications should include such items as odor, total solids, pH, sediment, stability; application characteristics such as spreading, drying time, and recoating; gloss, color and transparency, flexibility and adhesion, buffing, tackiness, and slip resistance; wear resistance, water resistance such as spotting and wet mopping; spot waxing and removability. One other activity of the Subcommittee on Specifications has been the preparation of a recommended practice for cleaning wax floors.

The next meeting of the main committee is planned for May, 1953, in Chicago immediately following the meetings of the Chemical Specialties Manufacturing Assn. Subcommittee meetings, planned for December of this year, will be announced later.

ABC Countries Agree on Permanent Engineering Standards Organization

ANNOUNCEMENT of an agreement among United States, Canadian and British technicians on a permanent organization to work on unification of engineering standards, has been made by John R. Steelman, Acting Director, Office of Defense Mobilization.

The agreement was reached at a recent meeting to which Dr. Steelman invited leading Canadian and British standardization experts. The Director said that the American, British, Canadian Conference on standards had been organized with Howard Coonley, Director of Conservation, Defense Production Administration, as permanent chairman.

J. R. Townsend, Assistant to the Director, ODM, was temporary chairman and represented Dr. Steelman at the meetings.

General accord was reached on all major items including drafting standards and practices, screw threads, pipe threads, threads and fittings for gas cylinders and fits and tolerances. Permanent committees were named in each of these fields to study details and report back to the next meeting of the conference set for October 14.

The agreement reached on drafting practices was regarded by Mr. Townsend as particularly important and impressive since it will make drawings mutually understandable and save thousands of manpower hours.

General accord is now in sight for most standards and much progress has been made since representatives of the three countries met in Ottawa in 1945.

Dr. Steelman declared the standardization program "has our enthusiastic support and we feel the entire effort is of tremendous importance to defense and conservation of manpower."

Stanley J. Hurley, British Standards Institution, and chairman of the Institutions Engineering Division, headed the British delegation. James G. Morrow, Canadian Standards Association, was head of the Canadian group.

The United States was represented in addition to Mr. Coonley and Mr. Townsend, by Rear Admiral J. W Fowler, Department of Defense; Dr. E. C. Crittendon, representing Secretary of Commerce Sawyer.

Summary of Certain ISO Sessions on Mica, Lac, and Steel

DURING June in New York there were a number of meetings of committees and special groups of the International Organization for Standardization which was holding its triennial meeting there. This meeting had been scheduled in conjunction with the ASTM 50th Anniversary Meeting.

Many American representatives attend the ISO meetings. Summaries have been prepared of certain of these sessions dealing with mica, shellac, and steel which follow.

Sessions on Mica, ISO/TC 56

June 9, 10, and 11, 1952, Columbia University

DR. LAL C. VERMAN, Director of the Indian Standards Institution, officially opened the Mica Session. Mr. Chandmull Rajgarhia, President of the Federation of Mica Associations of Bihar, then took the chair and made a brief address pointing out the great need for international standardization in the mica field. The meeting was attended by 47 delegates from six nations. Of these 32 represented the United States. Two Japanese experts were also present as observers.

It was decided to base discussion for the first day on Methods for Grading Processed Mica. The first item on which agreement was reached dealt with the line of demarcation between blocks and thins with the present minimum thickness of 0.007 in. to be retained over the objections of the United Kingdom. Certain differences in "Terminology" were then ironed out having to do with "Half-Trimmed Mica," "Processed or Unmanufactured Mica," and "Book-Form Splittings." Discussion then turned to "V" cuts and the minimum ratio of total to usable area.

The second and third days of the meeting were devoted to further discussions of such questions as trimming of blocks, thins, and condensers for removal of cracks, holes, reeves, and crossgrains and the ratio governing usable area. It was further agreed to replace the present definitions of "Inclusion" with the ASTM definition.

The question of the establishment of "Visual Classification Standards for Blocks and Thins" was referred to a working group. This group met on Monday, June 23 at NEMA headquarters. They examined certain classes of the large group of mica samples as submitted by the Indian delegation and eventually reported upon six classes of "Bihar Blocks" selecting in each case a small percentage of the samples as meeting requirements for the specified grade. The results of their work were referred to the Indian delegation for later consideration.

In closing the final regularly scheduled session on June 11 Dr. Verman expressed the opinion that much good had been accomplished simply through the discussion of the differences in practices of the various countries which he felt would eventually lead to a much wider agreement on international mica standards.

Sessions on Lac, ISO/TC 50

June 23 to 25, 1952, Hotel New Yorker

THE second meeting of ISO Technical Committee 50 on Lac was held in the New Yorker Hotel with Dr. Lal C. Verman of the Indian Secretariat, presiding.

Delegations from France, Germany, India, United Kingdom, and United States of America were in attendance. A technical expert from Thailand was extended the privileges of the meetings by the chairman.

The committee considered the second draft proposals of the International Specifications for Seedlac, Shellac, and Dry Bleached Lac. These drafts, which were evolved from decisions reached at the first meeting of the committee in New Delhi, India, in January, 1950, were reviewed in the light of comments received, thereon, from the French, Indian, British, and American member bodies. Various requirement differences pertaining to the marketing and use of lac resins peculiar to the countries represented were successfully reconciled. The Secretariat was authorized to redraft the specifications to include the changes agreed upon by the committee.

When completed and formally accepted, these specifications, which contain both requirement limits for various physical and chemical properties, and appropriate test procedures therefor, will be used internationally for the procurement of the several types of lac resins.

The committee agreed to continue its study of test procedures for the determination of (1) color, (2) bleaching characteristics, (3) cold alcohol soluble, and (4) hot alcohol insoluble of lac resins.

After considering a request for the development of a test for the adhesive strength of shellac and its incorporation in the Shellac Specification, the committee concurred in the opinion that until specific information as to service requirements of the shellac was made available the problem could not be satisfactorily studied.

By unanimous ballot, the committee deleted the development of specifications for sticklac and kiri (refuse lac) from its future program.

Sessions on Steel, ISO/TC 17

June 9 to 12, 1952, Columbia University

DURING a four-day meeting (June 9 to 12) at Columbia University, agreements with respect to six methods of testing steel were reached by ISO Technical Committee 17 on Steel. These methods included the Rockwell, Brinell, and Vickers (Diamond Pyramid) hardness tests, the bend test, and Izod and Charpy impact tests.

Delegates from the national standards bodies of Belgium, Denmark, Finland, France, India, Italy, New Zealand, Norway, Spain, Switzerland, the United Kingdom, the United States, and Yugoslavia attended the sessions. H. A. R. Binney, Director of the British Standards Institution which holds the secretariat of Technical Committee 17, served as chairman. The United States is listed as an observer nation of the group, but upon the the invitation of Chairman Binney, joined freely in the discussions. The Americans present included E. V. Bennett and H. L. Fry of the Bethlehem Steel Co., R. D. France of Frankford Arsenal, R. H. Heyer of Armco Steel Corp., V. E. Lysaght of Wilson Mechanical Instrument Co., W. H. Mayo of U. S. Steel Co., K. M. McInerney of Republic Steel Corp., and Sam Tour of Sam Tour and Co., consulting engineers. Messrs. Bennett, Fry, Mayo, and McInerney are members of ASTM Committee A-1 on Steel; Messrs. France, Heyer, Lysaght, and Tour are affiliated with ASTM Committee E-1 on Methods of Testing.

The tolerances on the various dimensions given in the tests were not included in the work of the committee at this time. These tolerances, together with questions of the calibration and accuracy of testing machines, will form a high priority item for working groups which the committee set up.

One working group will reformulate draft proposals on tensile strength testing which were drawn up at a committee meeting held in London in the Autumn of 1950, to bring them in line with decisions reached this week. A second group will prepare proposals for tests on sheet metal and strip. A third will prepare test proposals for wire.

When the agreements reached this week have been revised to include tolerances, they will be submitted to the standards bodies of the participating nations for ratification.

The committee is expected to meet again in full session sometime within the next two years after the working groups have reported.

The reasons and aims of ISO Technical Committee 17 were stated as follows by G. Weston, Technical Director of the British Standards Institution:

"The industrial picture throughout the whole world is probably dominated today by the supply of steel more than by any other material. In every progressive country there is a growing demand for steel which, unfortunately, the current supplies of steel are inadequate to meet.

"One means of easing this difficult position is by ensuring that such supplies of steel as are available are put to the most

effective and efficient use. The urgent need of achieving this, coupled with the magnitude of the international trade in steel and steel products, makes the work of the International Committee on Steel ISO/TC 17 of outstanding importance.

"Efficient use of steel demands that during its production and in its subsequent processing, its physical properties must be measured and continuously controlled by methods of test which will provide reliable data. Technical Committee ISO/TC 17 has set itself the task of establishing methods of test which will be acceptable internationally.

"This will mean that when the steel is produced and tested in one country the results will be understandable to the user who may be in another country.

"It would be superfluous to underline the part which U.S.A. can and should play in the work of the committee, not only because it is in the forefront of steel production, but also because of the valuable work that has been done over many years by metallurgical experts in this country. It is confidently hoped that the experts from the countries represented will find much common ground for agreement on the more generally used tests.

"The establishing of a basis for expressing the properties of steel will, however, be but a first step toward the goal of arriving at agreed standards for the steel itself so that international trading in this important commodity will be facilitated."

Armed Forces Rubber Testing Symposium*

RUBBER manufacturers who sell to the Army, Navy, and Air Force have long voiced their displeasure of the necessity of conforming to requirements in current Military specifications which call for different low-temperature methods and different apparatus for essentially the same rubber item. Since such a large proportion of rubber goods is presently being manufactured for the Armed Forces and since low-temperature performance is often a prime requisite, a decided need exists for standardization of testing methods and apparatus. Recognizing this need, Armed Forces engineers responsible for rubber materials met at The Pentagon in March, 1952, to discuss the possibilities for agreement on standard methods and test equipment for use in Military procurement specifications of rubber items intended for low-temperature applications.

As a result of the meeting, it was agreed that low-temperature rubber tests and apparatus would be divided into four categories as follows:

1. *Brittleness.*—The lowest limit of serviceability as determined by impact.
   Test or Apparatus.—ASTM D 746[1] (motor or solenoid actuated).
2. *Hardness.*—Resistance to indentation.
   Test or Apparatus.—Either the Pusey and Jones or the Admiralty dead load indenter type tester as specified in Federal Specification ZZ-R-601.
3. *Stiffness.*—The degree of pliancy or ease of bending.
   Test or Apparatus.—Gehman torsional stiffness.
4. *Elastic Recovery.*—The force exerted by an elastomer to return to its original dimensions after deformation (an indication of crystallization on extended storage at low temperature).
   Test or Apparatus.—Compression set, or temperature-retraction or tension recovery.

Some laboratory work has been completed using the apparatus chosen. Differences in test results have been observed between motor and solenoid actuated types of brittleness apparatus. Apparently, these differences are produced by variations in speed of impact. Although both the Pusey & Jones and Admiralty hardness testers are listed, tests indicate that the Pusey & Jones instrument does not operate satisfactorily at −65 F. Therefore, it is assumed that the trend will be toward the use of the Admiralty tester. The choice of the Gehman apparatus in preference to the Clash Berg for stiffness testing does in no way imply that the Gehman is the better instrument; actually both received an equal performance rating. The choice was made solely on the basis that the Gehman instrument was more generally available in government and private laboratories.

Significance of These Agreements:

The changes in methods and apparatus from those currently specified in Military specifications will occur gradually as the specifications are amended or revised. Thus, several years may elapse before the conversion to uniform test methods is accomplished. As an aid to suppliers who desire to retain their present apparatus, the cognizant Armed Forces activity exercising custodianship over a particular rubber specification will attempt to prepare interpolative charts from the present apparatus to the one agreed upon as the result of this Symposium. However, in cases of disagreement, the apparatus and limits specified in the specification will be the primary standard. The information presented herein is intended to indicate the general trend of thinking of the military with regard to low-temperature rubber tests and should be especially helpful to those Armed Forces suppliers who contemplate the purchase of new low-temperature rubber test apparatus. It is to be emphasized that the agreements reached concern the type of apparatus only, and not test procedures such as conditioning times and test temperatures. These latter items vary with the individual Armed Forces activity and its particular end item or service test requirements. In addition, for the same reason, no attempt was made to standardize on end-item tests. Further, it is not intended or implied that every Military specification for rubber will contain all of the tests and apparatus or conversely no other tests than those described herein.

The following Armed Forces groups concurred in these agreements:

Bureau of Ships
Bureau of Aeronautics
Bureau of Yards and Docks
Bureau of Supplies and Accounts
Bureau of Ordnance
Wright Air Development Center
Quartermaster Corps
Chemical Corps
Signal Corps
Ordnance Corps
Engineer Corps

Future Action:

It was decided that a similar symposium would be held annually to implement the decisions of this meeting and to attempt to reach agreements relevant to other rubber test apparatus and conditioning equipment. For purposes of future agenda, informal suggestions from interested activities are solicited.

September BULLETIN to Preview Current Standards Work

An extensive survey of standardization work currently in progress in the technical committees will again appear in the September issue of the BULLETIN.

This survey, which has been published annually for several years, serves to acquaint the membership in general with the nature and direction of the standards and specifications projects under way.

* Prepared by Irving Kahn, Materials Engineer, Department of the Army, Office, Chief of Ordnance, Washington, D. C., and Chairman of the Symposium.

[1] Tentative Method of Test for Brittle Temperature of Plastics and Elastomers (D 746 - 44 T), 1949 Book of ASTM Standards, Part 6, p. 546.

More Unsolved Problems

Additional Research Projects from ASTM Committees

IN PUBLISHING serially in the ASTM BULLETIN the unsolved problems submitted by various technical committees attention has been given to the desirability of presenting problems from varying fields of research. The articles which appeared in the January, February, April, and May issues included concrete, wood, asphalt, and fatigue. This issue includes problems on mortar, bituminous materials, and fatigue.

As indicated previously, the 32 problems submitted to date have been collated into a separate pamphlet, "Some Unsolved Problems" and copies are available on request to Society Headquarters, 1916 Race Street, Philadelphia 3, Pa. The problems published previously in the BULLETIN included:

- Durability of Concrete
- Constitution of Lignin
- Test for Rapid Appraisal of Weatherability of Asphalts
- Fatigue Strengths of Metals Subjected to Combined Stresses
- The Effect of Various Factors on the Fatigue Life of Materials
- Particle Size of Hydrated Limes
- Can Mortar Properties Be Improved by More Thorough Mixing?
- Non-Destructive Tests for Wood
- Temperature and Humidity Measurements on Asphaltic Roofing Materials
- Study of Crack Genesis and Growth in Steel
- Rheological Properties of Aqueous Suspensions
- Chemical Reactions of Aggregate in Concrete
- Grading of Stone Sand for Masonry Mortars
- Evaluation of Fatigue-Notch-Sensitivity Index
- Fatigue Properties of Fully Hardened Steels
- Prediction of Concrete Quality from Vibration Frequency and Velocity Measurements
- Analysis of Fresh Mortars
- Relation Between Stress History and Fatigue Damage

This issue includes:

- Determination of the Magnitude of the Force Applied by the Mason to Masonry Mortars
- Measurement of Rheological Properties of Bituminous Materials
- Effect of Size and Shape of Member Upon Fatigue Behavior

Determination of the Magnitude of the Force Applied by the Mason to Masonry Mortars

Statement of Unsolved Problem Contributed by Committee C-12 on Mortars for Unit Masonry

Problem:

Before any adequate machine can be developed to study workability and allied problems of masonry mortars, such a determination is fundamental.

Present State of Knowledge:

At present, only rough estimates have been made as exemplified in the Vicat penetration test, the flow table of the Voss Extrusion Apparatus, among which a great spread of force is found.

Questions That Need to Be Answered:

1. How much force does the mason use in spreading the mortar, in furrowing it, in scraping off the excess and spotting it on the end of the brick?
2. When he fills the head joint he "throws" mortar on the end of the brick. What force does he use?

Introductory References:

(1) Tentative Specification for Flow Table for Use in Tests of Hydraulic Cement (ASTM Designation: C 230 – 49 T), 1949 Book of ASTM Standards, Part 3, p. 25.

Additional information may be obtained from J. M. Hardesty, Bell Telephone Laboratories, Inc., Murray Hill, N. J.

Measurement of Rheological Properties of Bituminous Materials

Statement of Unsolved Problem Contributed by Committee D-8 on Bituminous Waterproofing and Roofing Materials

Problem:

Many hot or cold applied bituminous construction materials exhibit complex and anomalous flow characteristics. Methods and equipment are not available to permit the measurement of the rheological properties of these products in sensible units, resulting in lack of proper specifications, or in misapplication of materials.

Present State of Knowledge:

Methods and devices are available by which the viscosity of Newtonian fluids, and the flow characteristics of some of the simpler non-Newtonian systems may be evaluated, providing the consistencies in question are not too large. There are also available many empirical instruments which may be used to estimate roughly in various nonrelated units some of the combined effects encountered when more complex systems are subjected to various stresses or strains.

Questions That Need to Be Answered:

The development of methods and instruments by which the flow properties of bituminous composition, whether fluid or viscous, Newtonian or non-Newtonian, may be determined over wide ranges of temperature and consistencies.

The methods and instruments selected or developed must be such as will permit considerable changes in the variables under study and still give results in absolute units, so that standards and measurements throughout the consistency range may be readily compared and connected, eventually providing rheological diagrams suitable for the specification of materials and preferred methods of application.

Introductory References:

(1) H. Green, "Industrial Rheology and Rheological Structures, John Wiley & Son, New York, N. Y.

Additional information may be obtained from W. F. Fair, Jr., Koppers Co., Inc., Westfield, N. J.

Effect of Size and Shape of Member Upon Fatigue Behavior

Statement of Unsolved Problem Contributed by Committee E-9 on Fatigue

Problem:

Differences in specimen size and shape result in data of uncertain compatibility (both from laboratory to laboratory and from one type of test to another). Information is needed to distinguish between the effect, on fatigue strength and on scatter in fatigue test results, of (1) the volume of highly stressed material, (2) the surface finish, and (3) the stress gradient.

Present State of Knowledge:

Size and shape of the test specimen appear to affect fatigue test results, particularly in repeated-bending tests. In tests reported to date, different fabrication techniques probably introduce variability in surface effects when specimens of different shapes are made. Differences in specimen size usually involve both a difference in the volume of highly stressed material and in the stress gradients involved; investigations designed to separate these effects have not been generally reported.

Questions That Need to Be Answered:

1. What is the effect of the volume of highly stressed material on fatigue results (under conditions of constant surface finish and stress gradient)?
2. What is the effect of surface finish (including not only "smoothness" but basic preparatory techniques) on fatigue results (under conditions of constant volume of highly stressed material and constant stress gradient)?

3. What is the effect of the stress gradient on fatigue results (under conditions of constant volume of highly stressed material and constant surface finish)?

Introductory References:

(1) T. J. Dolan, J. H. McClow, and W. J. Craig, "The Influence of Shape of Cross Section on the Flexural Fatigue Strength of Steel," Paper No. 49-A55, *Transactions*, Am. Soc. Mechanical Engrs., July 1950, p. 469.

(2) P. K. Roos, D. L. Lemmon, and J. T. Ransom, "Influence of Type of Machine, Range of Speed and Specimen Shape on Fatigue Test Data," ASTM BULLETIN, No. 158, May, 1949, pp. 63–65.

(3) J. T. Ransom and R. F. Mehl, "The Statistical Nature of the Endurance Limit," *Journal of Metals*, June, 1949, pp. 364–365.

Additional information may be obtained from T. J. Dolan, Talbot Laboratory, University of Illinois, Urbana, Ill.

Effect of Cleaning on Water-Vapor-Barrier Paints

IN MODERN building construction a water-vapor barrier is included in the wall construction to prevent condensation which would occur when the warm, humid air from the interior migrates toward the outside and is cooled below its dew point. Where such installation has not been made or is impractical, the interior paint may be selected to act as a fairly effective water-vapor barrier.

While some paints have been studied and are known to be effective barriers, little is known of their effectiveness for this purpose after they have been cleaned with soaps and other cleaning agents. An evaluation of three types of cleaning compounds and six types of interior paints was carried out by the National Bureau of Standards in cooperation with the Housing and Home Finance Agency.

The "dry-cup" method, usually used for testing the water-vapor resistance of vapor-barrier paints was employed and the cleaning procedures consisted of combinations of washing operations using three types of detergents, with a cellulose sponge and a bristle brush as the scrubbers.

The NBS tests indicated that the water-vapor permeance of the conventional types of interior paint (enamels and flat paints) is not affected appreciably by cleaning, regardless of the type of detergent employed, provided a soft cleaning implement such as a cloth or a sponge is used. However, some increase in water-vapor transmission may occur after repeated cleanings if a harsh implement such as a stiff-bristle brush is used. Results also showed that some types of interior paints such as the resin emulsion and the "one-coat flat" paint may not be acceptable as water-vapor barrier materials under strict requirements.

PERSONALS...

News items concerning the activities of our members will be welcomed for inclusion in this column.

NOTE—These "Personals" are arranged in order of alphabetical sequence of the names. Frequently two or more members may be referred to in the same note, in which case the first one named is used as a key letter. It is believed that this arrangement will facilitate reference to the news about members.

F. H. Allison, Jr., until recently Chief Metallurgist, United Engineering & Foundry Co., Pittsburgh, Pa., has been appointed Assistant Vice-President in Charge of Metallurgy and Roll Sales, Blaw-Knox Co., of the same city. According to a recent announcement, this is a new post within the company, and Dr. Allison will be directly responsible for integrating the sales and servicing functions of the two Blaw-Knox roll organizations—Pittsburgh Rolls and Lewis Rolls. He also will have full responsibility for the metallurgy in the company's Pittsburgh foundries.

Emil H. Balz has been appointed Director of Research of Glass Fibers, Inc., Toledo, Ohio. In the past, Dr. Balz has served as both a consultant to the glass concern and has had charge of the glass and plastic laminate laboratory.

Jose B. Calva, internationally known chemical engineer (Minneapolis, Minn.) recently was honored by the Technical Association of the Fur Industry by presentation of the Leo Altenberg Award for outstanding work in the field of fur technology. This award is presented annually to stimulate the advancement of scientific knowledge pertaining to fur processing.

Col. Martin B. Chittick, on his recent retirement from the Army, in which he had been commanding officer of the 1966th Organized Research and Development Unit in New York, was presented with the first Army Certificate of Achievement in recognition of outstanding service in the organized reserve corps program.

Simon Collier, Director of Quality Control Johns-Manville Corp., New York City, was elected President of the American Society for Quality Control at the Society's sixth annual convention held in Syracuse in May. Newly elected Vice-Presidents included Julian Toulouse, Chief Engineer, Quality and Specifications Div., Owens-Illinois Glass Co., Toledo, Ohio. The new Executive Secretary is Edward B. Haden, Quality Control Director, Esterbrook Pen Co., Camden, N. J.

V. R. Collura, until recently Secretary-Treasurer, Public Service Testing Lab., Inc., is now with the U. S. Treasury Dept., Customs Labs., New York City, in the capacity of Chemist.

F. P. Diener, formerly Chemical Engineer, has been named Director of Tests and Research, Universal Atlas Cement Co., New York City.

Matthew E. Dunlap, Research Engineer, U. S. Forest Products Laboratory, Madison, Wis., retired recently after more than 35 years on the laboratory staff. He plans to divide his time between the management of his farms in Champaign County, Ill., and private consulting service along the lines of his work at the laboratory. With his wife and son he will continue to reside at 1122 Waban Hill, Madison 5, Wis.

Louis M. Eyermann is now General Attorney, Office, Chief of Engineers, Resettlement Branch, U. S. Department of the Army, St. Louis, Mo. He was previously Test Engineer, McConnell Aircraft Corp. in the same city.

J. M. Fairbairn, until recently Vice-President, has been named President, Charles Warnock and Co., Ltd., Montreal, Canada.

George Rice Gohn, newly elected Director of the Society, and for many years a member of the technical staff, Bell Telephone Laboratories, New York City, has been made Supervisor of the Creep and Fatigue Laboratories of his company.

William J. Grede, President, Grede Foundries, Inc., Milwaukee, Wis., was chosen national president of the Young Men's Christian Association at the meeting of the Association in Detroit in May. Mr. Grede also is head of the National Association of Manufacturers.

Gustavo Perez Guerra, Civil Engineer of Caracas, Venezuela, is now associated with Ingenieria de Suelos, S. A., of that city.

W. A. Haley, previously with the American Concrete Pipe Assn., Chicago, is now on the engineering staff of the Southern Block and Pipe Corp., Norfolk, Va.

J. T. Helsley has been named President and General Manager, Construction Laboratories, Inc., Los Angeles. He was formerly with the J. L. Peterson Testing and Inspection Laboratory of the same city.

George O. Hiers, for many years Metallurgist, Research Laboratories, National Lead Co., New York City, has opened his own offices as Consultant Metallurgist, 21 Coventry Road, Baldwin, N. Y., simultaneously continuing as consultant on retainer for the National Lead Co. A long-time, very active member of the Society, Mr. Hiers has participated in the activities of the New York District Council since 1935, serving as its Secretary 1936–1950, Vice-Chairman 1950–1952, and at the recent ASTM Annual Meeting was elected to head the New York group as Chairman. He also is presently serving on the Administrative Committee on District Activities.

J. T. Holmes has been named President, Holmes & Narver, Inc., Los Angeles, the former partnership of Messrs. Holmes

and Narver (architects and engineers) recently having been incorporated.

T. H. Hopper, Head, Analytical and Physical Division, Southern Regional Research Laboratory, New Orleans, La., has been reelected Secretary of the American Oil Chemists' Society. Mr. Hopper is technical editor of the manual of the Chemists' Society, "Methods of Analysis."

Oakley F. Hoyt has been appointed General Manager of the Ossining plant of Hudson Wire Co., Ossining, N. Y., following the recent retirement of Charles J. Royle as Executive Vice-President and General Manager.

Professor Emilio Jimeno of the Metallurgical Laboratory, University of Madrid in Spain, has been honored by election as a full member of the Spanish Real Academia de Ciencias Exactas, Fisicas y Naturales. In receiving this distinction at a recent special and solemn reunion of this body, Professor Jimeno spoke on "Science and Society."

Robert R. Kaufman, for 29 years associated with The Master Builders Co., Cleveland, Ohio, has resigned his position as Chief Engineer, and has set up a chemical and physical laboratory for research and development work in Ormond Beach, Fla., where he will do consulting work. He also will be retained as consultant by Master Builders. Mr. Kaufman's new laboratory will be known as the Ormond Chemical & Research Co.

Gordon J. LeBrasse has been named Acting Director of Research of Federal-Mogul Corp., Detroit, Mich. Mr. LeBrasse has been employed by Federal-Mogul as a metallurgist since 1940, and had been superintendent of the company's research laboratory in Ann Arbor since 1949. A member of a number of technical societies, Mr. LeBrasse will act as representative of his company's ASTM membership, succeeding E. R. Darby, recently retired Vice-President of Research and Development.

G. Howard LeFevre, very active in ASTM work, and Secretary of Committee B-2, is now Vice-President and Manager of Metals Sales of his company, United States Smelting, Refining and Mining, New York City.

William Lerch, until recently Manager, Department of Applied Research, Portland Cement Association, Chicago, Ill., has been named Administrative Assistant.

G. O. Linberg, formerly Director and Vice-President in Charge of Sales, Belle Chemical Co., Boston, Mass., has accepted appointment as Vice-President, Synthron, Inc., Ashton, R. I.

Pauline Beery Mack, for many years Director, Ellen H. Richards Institute, School of Chemistry, The Pennsylvania State College, has been named Dean of the College of Household Arts and Sciences, Texas State College for Women, at Denton.

Joseph Marin, Professor of Engineering Mechanics and Research Professor of Engineering Materials, Pennsylvania State College, has been awarded a Fulbright Professorship to lecture at the Technological Institute at Trondheim, Norway.

W. J. McCoy, formerly Manager of Research Lab., Lehigh Portland Cement Co., Allentown, Pa., has been named Director of Research by his company. Mr. McCoy is taking an active part in the 50th Anniversary Celebration of Committee C-1 on Cement, to be held in Philadelphia this Fall. He also is a new member of the Philadelphia District Council.

Douglas McHenry has been appointed Administrative Assistant to A. Allan Bates, Vice-President for Research and Development, Portland Cement Assn., Chicago, Ill. Mr. McHenry is the author of numerous articles on concrete technology. He headed Structural Research the Engineering Laboratories Branch of the Bureau of Reclamation, for nine years prior to his appointment as head of the Association's Concrete Laboratory Section in 1951.

Paul D. Merica, Executive Vice-President and a Director of International Nickel Co. of Canada, Ltd., has been elected President of that company and of the International Nickel Co., Inc., U. S. subsidiary. Mr. Merica is a long-time member and a Past-Director of the Society.

Hamilton Migel has been appointed to the newly created position of second Vice-President in Charge of Engineering, Magnaflux Corp., Chicago, Ill. In this capacity he will have over-all direction of research and design engineering.

Adair Morrison, formerly head of the Radiology Laboratory, Physics Division, National Research Council of Canada, Ottawa, has joined the staff of Arthur D. Little, Inc., Cambridge, Mass., as assistant to the newly appointed Science Director, Howard O. McMahon.

Irving A. Oehler, who has been Director of Metallurgy and Research of American Welding and Manufacturing Co., Warren, Ohio, has been named to the newly created post of Administrative Assistant to the Executive Vice-President. Dr. Oehler joined the company in 1942; he was previously Assistant Chief Metallurgist, Buffalo district, for Republic Steel Corp.

T. V. Ramamurti, until recently Technical Director, National Radio and Engineering Co., Ltd., Bombay, is now Technical Secretary, National Physical Laboratory of India at New Delhi.

F. E. Richart, Jr., formerly Assistant Professor of Mechanical Engineering, Harvard University, is now on the faculty of the University of Florida, Gainesville, as Associate Professor of Civil Engineering.

George Roberts, Chief Metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., has been elected to the Board of Directors of the Metal Powder Association. The present members of the Board of the Association also include Richard P. Seelig, Vice-President, American Electro Corp., Yonkers, N. Y.

Rudolph A. Schatzel has been elected a director of the Rome Cable Corp., Rome, N. Y. Mr. Schatzel is a Vice-President and Director of Engineering and Research of the company. With the electrical wire industry more than a quarter of a century, he was named in 1945 a member of the technical industrial intelligence team to investigate production and technology of the German rubber industry. Active in ASTM for many years, Mr. Schatzel is currently a member of the Board of Directors of the Society.

Earl B. Smith, Professor Emeritus of Mechanical Engineering, The City College of New York, is now with the National Bureau of Standards, Washington, D. C., as Mechanical Engineer.

Gustaf Soderberg, Consulting Engineer, and formerly Editor of the *Journal* of the American Electroplaters' Society, has gone to Sweden where he will assume a faculty position. He is widely known in the Society where he was active particularly in the work of Committee B-8 on Electrodeposited Metallic Coatings (Secretary 1941–43, and more recently Vice-Chairman), and also formerly on the Philadelphia District Council. Dr. Soderberg is a leading authority in the field of electroplating. He can be reached at the following address: c/o Dr. Gösta Birath, Renströmska Sjukhuset, Gothenburg 17, Sweden.

J. R. Trimble, until recently Assistant Manager, has been appointed Manager, Department of Metallurgy, Inspection and Research, Tennessee Coal & Iron Div., United States Steel Co., Fairfield, Ala., succeeding R. H. Ledbetter, who has retired. An active member of the Society and of Committee H on Steel, Mr. Trimble is serving a term on the Board of Directors.

Everett R. Turner, formerly Supervisor, Refining Dept., Quebec Iron and Titanium Corp., Sorel, Canada, has accepted a position as Assistant to the Works Manager, Dominion Tar & Chemical Co., Ltd., Cornwall Works, Cornwall, Ont., Canada.

Simultaneously with the approval by its directors of a new plan of organization, the National Association of Wool Manufacturers in March named **Edwin Wilkinson** Executive Vice-President. Mr. Wilkinson succeeded the late Arthur Besse, who died last November, as the chief executive officer of NAWM. Mr. Besse served as past-president and Mr. Wilkinson's title was assistant to the president.

The new NAWM plan provides for election of an honorary industry president and the addition of a public relations department. Ames Stevens was elected president at the annual meeting of the Association held in May. The public relations department will be headed by a public relations counsel under direction of the board through Mr. Wilkinson.

Internationally known in the textile field, Mr. Wilkinson has represented NAWM in ASTM and ASA for many years. He has been very active in the work of ASTM Committee D-13 on Textile Materials, and has served as representative of the Society since 1939 on Federation Laniere Internationale.

NECROLOGY . . .

The death of the following members has been reported

EDWARD H. BERGER, Consulting Chemist, Johns-Manville Corp., New York City (May 12, 1952). A personal member of the Society since 1934, Mr. Berger represented both the Asphalt Roofing Industry Bureau and Johns-Manville Corp. on various ASTM technical committees including D-1 on Paint, Varnish, Lacquer and Related Products, D-4 on Road and Paving Materials, D-21 on Wax Polishes and Related Material, and E-5 on Fire Tests of Materials and Construction. His most extensive service, however, was in Committee D-8 on Bituminous Waterproofing and Roofing Materials where as Vice-Chairman for 14 years, and as chairman of several subcommittees he contributed to many phases of the work, his leadership proving a great asset to this group.

E. KEMPER CARTER, Chairman of the Board of the Carter-Waters Corp., Kansas City, Mo. (December 23, 1951). Member since 1940. Mr. Carter, who served as a captain in the Army Engineer Corps during World War I, in 1921 founded the E. K. Carter Co., forerunner of Carter-Waters, and was president of the corporation from 1922 until 1940.

WARTON CLAY, Secretary-Treasurer, Perlite Institute, New York City, and former Secretary of the National Mineral Wool Assn. (January 2, 1952). A member of the Society since 1942, Mr. Clay had been an active participant in the work of Committees C-11 on Gypsum and C-16 on Thermal Insulating Materials.

LLEWELLYN N. EDWARDS, Bridge Engineer, Stonehaven, Glen Echo, Md. (May 13, 1952). A member of many scientific and technical societies, Dr. Edwards' affiliation with ASTM dated from 1912. In his earlier years he had participated for many years in the activities of Committee C-1 on Cement. An authority on the structure and history of bridges in the United States and Canada, he had a long career in his chosen profession and made many important contributions in the field of bridge and highway engineering. Born in 1873 in Otisfield, Me., Dr. Edwards, following his graduation from the University of Maine, served as bridge designer for the Boston and Maine Railroad, and subsequently for the Chicago Northwestern Railroad. He was structural engineer for the Grand Trunk Railway of Canada, and in that post designed the Coteau Bridge over the St. Lawrence River. He served for a number of years as Bridge Engineer for the State of Maine, and for almost twenty years was in the employ of the U. S. Bureau of Public Roads, having charge of all bridge construction involved in federal aid highway developments in the States of Texas, Oklahoma, Arkansas, and Louisiana, retiring in 1944.

It is said that Dr. Edwards, whose hobby was the gathering of early engineering books, probably possessed a greater volume of data relating to history, locations, types, and construction details than any other American engineer. For several years he had been preparing the manuscript for a book on "The History and Evolution of Early American Bridges."

He is survived by his widow, Mrs. Carolyn Hodgdon Edwards of Glen Echo, Md.; two daughters, Mrs. Zylba Hoare of Toronto, and Mrs. Marguerite Clowes of Hallowell, Me., and two grandchildren; also two brothers, Dr. Dayton James Edwards of Cornell Medical College, and Forrest Edwards of Otisfield, Me.

F. C. FYKE, Materials Engineer, Esso Engineering Dept., Standard Oil Development Co., Linden, N. J. (May 10, 1952). Long-time representative of his company on numerous ASTM technical groups, Mr. Fyke had been a member of Committee A-1 on Steel since 1930. He also had served for long periods on A-5 on Corrosion of Iron and Steel, B-2 on Non-Ferrous Metals and Alloys, B-5 on Copper and Copper Alloys, and E-7 on Non-Destructive Testing; and had represented his company on the Joint (AWS-ASTM) Committee on Filler Metal. He had been a member of the parent Society since 1946.

MARCUS A. GROSSMAN, Adviser, Research Planning, United States Steel Co., Pittsburgh, Pa. (May 22, 1952). Affiliated with the Society since 1925, Dr. Grossman, one of the country's leading metallurgical engineers, had participated actively through the years on many of the committees of the ferrous group, including A-1 on Steel and A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys. He had been a member since 1936 of Committee E-4 on Metallography, serving as Chairman of its Subcommittee on Grain Size and Section on Austenite Grain Size; also served for a number of years on Committee E-9 on Fatigue and its advisory group.

R. L. HALLETT, retired Chief Chemist, National Lead Co., Brooklyn, N. Y., and Consulting and Industrial Engineer, New York City (May 16, 1952). Member of the Society since 1920, and for many years active in various technical groups, his most intensive interest being concentrated in Committee D-1 on Paint, Varnish, Lacquer and Related Products, where he participated in the deliberations of the advisory and many subgroups, and served as Secretary of the main committee 1920—1930. He was a member of Committee B-2 on Non-Ferrous Metals and Alloys for eleven years, and represented D-1 on Committee E-1 on Methods of Testing for some time. He also had served since 1931 on the ASA Sectional Committee on Specifications for Sieves for Testing Purposes, as representative of the American Chemical Society.

Mr. Hallett was 70 years of age. Surviving are his widow, Mrs. Ann Elizabeth Beyer Hallett; a daughter, Mrs. Frances Denton; two brothers, William Hallett and Alfred Hallett; a sister, Mrs. May Banford, and a grandson.

WILLIAM KENDRICK HATT, Emeritus Professor Civil Engineering, Purdue University, Lafayette, Ind. (April 3, 1952). Member since 1898, and Honorary Member since 1938. (See accompanying article.)

C. D. HUMPHREYS, General Cable Corp., Research Laboratories, Bayonne, N. J. (November 1, 1951). Respresentative of his company since 1948 on Committees D-11 on Rubber and Rubber-Like Materials, and D-20 on Plastics.

ALAN PORTER LEE, President, Alan Porter Lee, Inc., Morristown, N. J. (August, 1951). Member of the Society since 1936, and of Committee D-12 on Soaps and Other Detergents for the same period.

FRANCIS G. MCKELVY, Chairman of the Board of Directors of Alpha Portland Cement Co., and Former President of the Company, Easton, Pa. (May 7, 1952). Graduating from Princeton in 1904, Mr. McKelvy had started employment with Alpha Portland Cement in 1906. A resident of Easton since that year, he had been an active participant in civic affairs, and a trustee of Lafayette College since 1933. He was a captain in the Army Ordnance Dept. in the First World War. His affiliation with ASTM covered a period of 35 years, during which time he was most interested in the activities of the cementitious groups.

LAWRENCE ORTOLANI, Materials and Tests Engineer, Texas State Highway Dept., Austin, Tex. (April 25, 1952). Representative of the Texas Highway Dept. since 1950 on Committees D-4 on Road and Paving Materials, and D-18 on Soils for Engineering Purposes, serving on numerous subgroups.

FELIX PAQUIN, Chemist, Felix Paquin and Associates, Galveston, Tex. (September 21, 1951). Member since 1926.

HELMAN ROSENTHAL, Director, Dallas Laboratories, Dallas, Tex. (November, 1951). Member since 1927.

W. W. SCHETTLER, Fairbanks, Morse & Co., Beloit, Wis. (March 1, 1952). Member of Technical Committee on Diesel Fuels of Committee D-2 on Petroleum Products and Lubricants since 1946.

MORRIS SCHRERO, Technology Librarian, Carnegie Library of Pittsburgh, Pittsburgh, Pa. (September, 1951). Representative of Carnegie Library membership since 1949.

W. W. SCOTT, JR., Vice-President and General Manager of Sales, Laclede Steel Co., St. Louis, Mo. (April 15, 1952). Representative of company membership since 1925, and representative of his company on Committee A-1 on Steel since 1924; also a former member of the St. Louis District Council.

N. A. C. (NICK) SMITH, Petroleum Chemist with the Petroleum Experiment Station of the U. S. Bureau of Mines, Bartlesville, Okla. (May 19, 1952). Formerly a member of the Society and of Committee D-2 on Petroleum Products and Lubricants for a number of years, having been active in the formation and early developments of the D-2 group. Born in Wellesley, Mass., Mr. Smith graduated from Clark University (Wor-

cester, Mass.) in 1909. After nine years of experience in industrial organic chemistry, he joined the Bureau in 1918 as an Assistant Petroleum Chemist, being stationed successively at Pittsburgh, Pa., Washington, D. C., and Bartlesville where he came in 1923. He was made Assistant Superintendent of the Station in 1925, and Superintendent in 1926, a position which he held until 1945 when he voluntarily relinquished it so that he might devote his time to writing on petroleum chemistry and crude oils. A charter member of the Petroleum Division of the American Chemical Society, he was an internationally recognized authority on the interpretation of crude oil analyses and was author or co-author of several publications including a bulletin describing the Bureau of Mines method for crude oil analysis.

J. VAN DER GRAAF, Director, N. V. Metallic Industry, Hilversum, The Netherlands. Member since 1951.

CHARLES A. WHITTON, Chief Engineer, Department of Architecture and Engineering, Oakland Public Schools, Oakland, Calif. (1951). Representative of membership of Oakland Public Schools since 1939.

WILLIAM J. WOLTER, General Manager, Sturgeon Bay Shipbuilding and Dry Dock Co., Sturgeon Bay, Wis. (September, 1950). Member since 1944.

William Kendrick Hatt
1868–1952

WILLIAM KENDRICK HATT, Honorary Member of the Society, Professor Emeritus, founder, and former head of the Purdue University School of Civil Engineering, died in Birmingham, Mich., on April 3 in his 84th year. A native of Fredericton, New Brunswick, Canada, he was a graduate of the University of New Brunswick, and later received his civil engineering degree from Cornell University. He began his teaching career as Professor of Civil Engineering at the University of New Brunswick, 1891–1892, followed by a year at Cornell University, going in 1893 to Purdue where he pursued his chosen profession—in his own words, "doing the things he liked to do best, including the development of young men"—until 1938 when he was named Professor Emeritus.

Professor Hatt served on many state and national commissions on work involving conservation, flood prevention, patent suits, highway research, building codes, etc. He was consulting engineer on timber tests, U. S. Forest Service, 1902–1908; on a committee on education and special training, War Department, 1918–1919; member of the Building Code Committee, U. S. Department of Commerce, 1921, chairman, 1928; member of Consulting Board on Materials of Hoover Dam, 1931. An outstanding expert on reinforced concrete and building materials, his services were in wide demand.

He was the author of "Laboratory Manual for Testing Materials," "Concrete Construction" (Encyl. Americana), co-author of "Concrete Work," and had written many articles on research in materials and construction. He received the Fuertes Gold Medal (Cornell, '03) and the Turner Gold Medal (ACI, '29). A member of many engineering societies, he was president of the American Concrete Institute, 1917–1919, and was made an honorary member of the Institute in 1932.

Professor Hatt's affiliation with ASTM dates from 1898 when the Society was still a section of the International Association with a membership of less than 200 individuals and companies. (His death leaves one surviving 1898 individual member.)

One of Dr. Hatt's early contributions to the Society literature was a report on impact tests, prepared jointly with Edgar Marburg in 1899. He was a member of Committee D-7 on Timber from its organization in 1904 to 1921 and was its first secretary, serving from 1906 to 1915. He was active, especially in the early years, in the work of a number of committees including the groups on cast iron and brick and served on Committee E-1 on Methods of Testing from its organization in 1904 through 1919. He served two terms on the Board of Directors of the Society, 1915–1917 and 1922–1924. In 1938 he was accorded the Society's highest honor when he was elected an Honorary Member, in recognition of his important contributions to the advancement of the Society's work and its welfare.

NEW MEMBERS···

The following 88 members were elected from April 26, to June 20, 1952, making the total membership 7276 . . . Welcome to ASTM

Note—Names are arranged alphabetically—company members first then individuals.

Chicago District

ADAMS, CLOVIS H., Chief, Mineral Products Lab., The Sherwin-Williams Co., 115th and Cottage Grove Ave., Chicago 28, Ill.

BOXSER, HERMAN, Second Vice-President, Acadia Synthetic Products, Division of Western Felt Works, 4115 W. Ogden Ave., Chicago 23, Ill.

CARLSON, LAWRENCE H., President, Hellstrom Corp., 9400 W. Belmont, Franklin Park, Ill.

MILLAN, JOHN F., Staff Engineer, Research Dept., Caterpillar Tractor Co., Peoria, Ill.

PARSON, ROBERT A., Materials Engineer, Pullman Standard Car Manufacturing Co., 10909 Cottage Grove Ave., Chicago 28, Ill.

Cleveland District

BRUSH DEVELOPMENT CO., THE, A. J. W. Novak, Commercial Engineering Manager, 3405 Perkins Ave., Cleveland 14, Ohio.

JACOBSEN, HAROLD F., Director, Packaging and Loading, American Steel and Wire Div., United States Steel Co., W. Sixth and Superior, Cleveland 13, Ohio.

RAWLINS, EDWARD B., Engineer, Fuels and Lubricants, The Cooper-Bessemer Corp., Mt. Vernon, Ohio.

WHITMER, V. W., Assistant Chief Metallurgist, Republic Steel Corp., Massillon, Ohio.

Detroit District

BRITT, C. E., Testing Department, Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio. For mail: 505 S. Maple St., Bowling Green, Ohio.

DORWIN, J. J., Acting Chief Engineer, The Oliver Corp., Plant 2, Battle Creek, Mich. For mail: 108 S. McCamly, Battle Creek, Mich.

MORZE, EUGENE W., Research Director, X-Ray, Inc., 13931 Oakland Ave., Highland Park 3, Mich.

TIFFANY, BURTON E., Research Chemical Engineer, Ford Motor Co., Dearborn, Mich. For mail: 11832 Ohio, Detroit 4, Mich.

WESTERMAN, RICHARD GRANDON, Chemical Engineer, Ford Motor Co., Dearborn, Mich. For mail: 17236 Evergreen, Detroit 19, Mich.

New England District

CABOT, GODFREY L., INC., Research Library, 49 Beach St., Boston 11, Mass.

BLODGETT, WILLIAM E., Ceramic Engineer, R. Guastavino Co., 660 Main St., Woburn, Mass.

JACKSON, HOWARD, Superintendent, Hubbard and Co., 5401 W. Roosevelt Rd., Chicago 50, Ill.

The 50th Anniversary Year is a good year to suggest names for Society Membership

To the ASTM Committee on Membership,
1916 Race St., Philadelphia 3, Pa.

Gentlemen:

Please send information on membership to the company or individual indicated below:

_____

_____

This company or individual is interested in the following subjects: indicate field of activity, that is, petroleum, steels, non-ferrous, etc.

_____

Signed_____

Date_____ Address_____

NEWTON, ROGER H., Director, Badger Manufacturing Co., 230 Bent St., Cambridge 41, Mass.

DEGNAN, WILLIAM G., Test Engineer, United Aircraft Corp., Sikorsky Aircraft Div., Bridgeport, Conn. For mail: 116 Babcock St., Hartford 6, Conn. [J]*

New York District

PERLITE INSTITUTE, Richard L. Davis, Secretary-Treasurer, 35 W. Fifty-third St., New York 19, N. Y.

SANFORD AND CO., ROY S., R. H. Casler, Partner, 25 Hillside Ave., Oakville, Conn.

BROWN, ERNEST S., General Manager, Research and Development Div., California Texas Oil Co., Ltd., 551 Fifth Ave., New York 17, N. Y.

CECIL, PAUL S., Ceramic Engineer, Seaporcel Metals, Inc., 2820 Borden Ave., Long Island City 1, N. Y.

GILG, FRANK X., Application Engineer, Babcock & Wilcox Co., 161 E. Forty-second St., New York 17, N. Y.

HEIDENREICH, E. LEE, JR., Owner, E. Lee Heidenreich, Jr., Designing Engineers, 75 Second St., Newburgh, N. Y.

HODGES, WILLIAM F., Metallurgist, Works Laboratory, General Electric Co., Schenectady, N. Y.

HOOVER, CLYDE F., Assistant Director of Research, Pequanoc Rubber Co., Butler, N. J.

JOHNSON, CHARLES ADAMS, Chemical Engineer, Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4, N. Y.

KENNEDY, D. S., Consolidated Edison Company of New York, Inc., 9 S. First Ave., Mt. Vernon, N. Y.

LITTLE, LEONARD S., Textile Consultant, Suite 1500, 101 W. Thirty-first St., New York 1, N. Y.

MARLEY, JACK L., Chemist, General Electric Co., Knolls Atomic Power Lab., Schenectady, N. Y. For mail: 1 Luella Rd., Latham, N. Y.

PATERSON, A. R., Allied Chemical and Dye Corp., Central Research Lab., Morristown, N. J.

SHAW, JOHN D., President, S.K.C. Research Associates, 445 Fifth Ave., Paterson 4, N. J

STEELE, FRANK J., Chief Pharmacist and Head, Department of Pharmacy, The Greenwich Hospital Assn., Greenwich, Conn. For mail: YMCA, Greenwich, Conn.

TREXLER, M. V., Phosphate Specialist, Technical Service, Westvaco Chemical Div., Food Machinery and Chemical Corp., 161 E. Forty-second St., New York 17, N. Y.

U. S. NAVAL SUPPLY FACILITY, Technical Library, Third Ave. and Twenty-ninth St., Brooklyn, N. Y.

VELANDER, EDY, The Royal Swedish Academy of Engineering Sciences, Room 863, 630 Fifth Ave., New York 20, N. Y.

WHITE, BLANCHE B., Research Section Head, Celanese Corp. of America, Morris Ct., Summit, N. J. For mail: 958 Springfield Ave., Summit, N. J.

YERGES, LYLE F., Vice-President, Waldvogel Brothers, Inc., 17 E. Forty-second St., New York 17, N. Y.

YURASKO, FRANK H., Head, Materials Inspection and Expediting Div., Standard Oil Development Co., Esso Engineering Dept., Box 121, Linden, N. J.

Ohio Valley District

IRETON, CARL A., Vice-President, Engineering, The Specialty Papers Co., 802 Miami Chapel Rd., Dayton, Ohio. For mail: Box 1031, Dayton 1, Ohio.

RETHWISCH, F. B., Product Supervisor, Reynolds Metals Co., Louisville, Ky. For mail: Route 1, Box 569, Louisville 7, Ky.

Philadelphia District

BENTLEY, HARRIS MANUFACTURING CO., W. H. Bentley, Jr., Sales Manager, Hector and Lime Sts., Conshohocken, Pa.

CLIFFORD, PATRICK FRANCIS, Chief Inspector, Pusey and Jones Corp., 508 Front St., Wilmington, Del. For mail: 401 S. Bancroft Parkway, Wilmington 5, Del.

SNOVEL, ELLIS R., JR., Engineer, Penna. Pump and Compressor Co., Easton, Pa.

VITCHA, EDWARD T., Divisional Metallurgist, Thompson Products, Inc., 1400 N. Cameron St., Harrisburg, Pa.

WILSON, WALTER R., Electrical Section Head, Switchgear Laboratory, General Electric Co., 6901 Elmwood Ave., Philadelphia 42, Pa. For mail: 36 Orchard Rd., Havertown, Pa.

Pittsburgh District

COOPER, JOSEPH G., Chief Inspector, United States Steel Co., 525 William Penn Pl., Pittsburgh, Pa. For mail: 1 Library Pl., Duquesne, Pa.

GAYNOR, THEODORE, Welding Engineer, Bethlehem Steel Co., Johnstown, Pa.

HOCK, HERBERT, Metallurgical Engineer, Weirton Steel Co., Weirton, W. Va.

VAN TYNE, ROY H., Chief Chemist, Firth Sterling Steel and Carbide Corp., McKeesport, Pa.

Southern California District

HARVILL CORP., P. M. Winslow, Chief Metallurgist, 6251 W. Century Blvd., Los Angeles 45, Calif.

COTTRELL, STEPHEN J., Production Superintendent, Calresin Corp., 333 N. Santa Anita Ave., Arcadia Calif. For mail: 1421 Basilone, Sun Valley, Calif.

Washington (D. C.) District

DEMING, W. EDWARDS, Professor of Statistics, Graduate School of Business Administration, New York University, 90 Trinity Pl., New York 6, N. Y. For mail: Bureau of the Budget, Washington 25, D. C.

DIGGES, THOMAS G., Chief, Thermal Metallurgy, National Bureau of Standards, Washington 25, D. C.

ELLINGER, GEORGE A., Chief Corrosion Section, National Bureau of Standards, Washington 25, D. C.

GELLER, R. F., Technologist, National Bureau of Standards, Washington 25, D. C. For mail: 5511 York Lane, Bethesda 14, Md.

GIERS, SERGE, Technical Manager, American Alcolac Corp., 3440 Fairfield Rd., Baltimore 26, Md.

GRAHAM, THOMAS R., Chief, Physical Metallurgical Branch, U. S. Bureau of Mines, College Park, Md.

LUBIE, ERWIN, M., Materials Engineer, Housing and Home Finance Agency, 815 Connecticut Ave., Washington, D. C. For mail: 917 Twenty-second St., S., Arlington, Va.

NATURAL RUBBER BUREAU, H. C. Bugbee, Vice-President, 1631 K St., N.W., Washington 6, D. C.

RICE, JAMES M., Research and Testing Engineer, National Crushed Stone Assn., 1415 Elliot Pl., N.W., Washington 7, D. C.

RICHMOND, JOSEPH C., Ceramic Engineer, National Bureau of Standards, Washington 25, D. C.

Western N. Y.-Ontario District

CLINE, ROBERT WILLIAM, Ceramist, Buffalo Pottery, Inc., Buffalo 10, N. Y. For mail: 377 Main, East Aurora, N. Y.

THOMASSON, H., Manager, Metallurgical Lab., Canadian Westinghouse Co., Ltd., Hamilton, Ont., Canada.

U. S. and Possessions

AMERICAN CYANAMID CO., ATOMIC ENERGY DIVISION, F. Allen Hall, General Manager, Box 752, Idaho Falls, Idaho.

LUMMUS COTTON GIN CO., A. L. Vandergriff, Chief Design Engineer, Box 1260, Columbus, Ga.

COLSTON, THOMAS EDGAR, JR., Spectrographer, Southern Electrical Corp., Box 989, Chattanooga, Tenn.

EDDLEBLUTE, C. L., Fabricator, Timber Fabrications, Box 997, Little River Station, Miami 38, Fla. For mail: 401 N. E. 85th St., Miami 38, Fla.

GUTIERREZ, VELA, L., Chemical Engineer Felix Paquin and Associates, 305—Twenty-second St., Galveston, Tex.

KINICK, W. J., JR., District Manager, Pittsburgh Testing Laboratory, 442 W. Third St., Salt Lake City, Utah.

SPINDLER, MARVIN R., Supervisor, Paint Laboratory Unit, U. S. Bureau of Reclamation, Denver Federal Center, Denver, Colo.

COLEMAN, JOHN H., Research Director, Radiation Research Corp., Box 8126, 526 Northwood Rd., W. Palm Beach, Fla. [J]

Other than U. S. Possessions

KIVETON PARK STEEL AND WIRE WORKS, LTD., A. T. Wood, Secretary, Kiveton Park near Sheffield, England.

SPERRY GYROSCOPE CO. OF CANADA, LTD., E. C. Longhurst, Inspection Superintendent, Box 6121, Montreal, P. Q., Canada.

BERRIMAN, R. W., Chief Metallurgist, Australian Aluminium Co., Pty., Ltd., Box 12, Granville, N.S.W., Australia.

BERRY, T. V., Commissioner, Greater Vancouver Water District, 1303 Sun Bldg., Vancouver, B. C., Canada.

CRANSBERG, R., Metallic Industry, N. V., Loosdrechtse Rading, Loosdrecht, The Netherlands.

DEISINGER, WALTER, Member, Board of Directors, Vacuumschmelze A. G., Hanau, Box 109, Hanau, Germany, For mail: Grüner Weg 37, Hanau, Germany.

HUGGENBERGER, A. U., Doctor of Technical Science, Ackersteinstreet 119, Zürich 49, Switzerland.

JAGGER, J. W., LIBRARY, University of Capetown, Rodebosch, Capetown, South Africa.

KOYANAGI, KEN'ICHI, Managing Director, Japanese Union of Scientists and Engineers, 2 Kyobashi 1 chome, Chuo-ku, Tokyo.

MARTIN, G., Superintendent of Research, London Advisory Committee for Rubber Research, Imperial Institute, London, England.

PUMPHREY, W. I., Murex Welding Processes, Ltd., Waltham Cross, Herts, England.

SAMAIN, JEAN, Director, Utexbel, S.A., 113 Rue des Fileuses, Renaix, Belgium.

SIMPSON E., RICARDO, Manager, Compãnia Electro Metalurgica S.A., Casilla 3463, Santiago, Chile.

THACKRAY, J. B., The Rio de Janeiro Tramway, Light and Power Co., Ltd., Caixo Postal 571, Rio de Janeiro, Brazil.

CAUSING, HUMBERT RODRIGUEZ, Civil Engineer, Porter-Urquhart, Skidmore, Owings & Merril, 575 Madison Ave., New York 22, N. Y. For mail: c/o PUSOM, Casa Postale 879, Casablanca, French Morocco. [J]

* J denotes Junior Members.

Inquiries concerning the" Advantages of Membership" will be welcomed during the Society's 50th Anniversary Year

To the ASTM Committee on Membership
1916 Race St., Philadelphia 3, Pa.

Gentlemen:

Please send me information on Membership in ASTM and include a membership application blank. Also related information on the 50th Anniversary Meeting.

Signed_____
Address_____

Date_____

NEWS NOTES ON

Laboratory Supplies and Testing Equipment

Note—This information is based on literature and statements from apparatus manufacturers and laboratory supply houses.

Instrument Notes

Water Vapor Indicator—The recently improved Aminco-Weaver Water Vapor Indicator measures water vapor content of compressed gases within the range of saturation down to 0.003 mg per l or less, with an accuracy within 10 per cent of the amount of water present according to the manufacturer. Measurements are said to be reproducible to 0.002 mg of water per l. Uses include: determining dryness of refrigerants (particularly the freons and other halogen compounds); studying the evaluation of water resulting from chemical or physical changes; and determination of water vapor content in gas manufacture, process control, laboratory research and testing, and inspection of gases under many conditions.

Bulletin 2227, American Instrument Co., Inc., Silver Spring, Md.

Creep Testing Machine—A new lever-arm creep testing machine of 12,000 lb capacity features a power-operated lifting mechanism for the weights used for loading specimens. During testing, the lifting platform automatically positions itself about ½ in. below the weight pan so that the shock of dropping weights is minimized when the specimen breaks in stress-rupture tests. The base is designed so that the machine need not be bolted to the floor. Contributing further to stability are leveling screws and a new type of shock absorber and vibration isolator.

Arcweld Manufacturing Co., 140 46th St., Pittsburgh 1, Pa.

Ultrasonic Thickness Testing—According to the manufacturer, the economy, speed, and convenience of nondestructive thickness measurements by the ultrasonic Audigage Thickness Tester can be materially increased under awkward conditions by the use of a new magnetic fixture to hold the searching unit against the plate being tested. This accessory is said to assure good contact and prevents accidental shifting of the searching unit during tests, permitting one man to operate the instrument alone in different locations. It is expected to be particularly valuable when working on ladders or staging, and when test points are beyond easy reach.

Branson Instruments, Inc., 430 Fairfield Ave., Stamford, Conn.

New Welding Analyzer—A new direct writing Welding Analyzer now records single-phase and three-phase resistance welding machine variables. Welding current and electrode force are measured and recorded simultaneously, and show the important squeeze, weld, hold, and off-time intervals. The new analyzer also records the small 180 cycle per sec component present in the three-phase welding machine current when ignitron rectifiers are used. The welding engineer can adjust the welding machine as the measurements are being made, due to the immediate availability of the information on the direct writing oscillograph. This new Welding Analyzer, Model BL-213, consists of modified Model BL-202 dual channel oscillograph, a modified Model BL-932 DC Amplifier, and Model BL-320 Universal Amplifier.

The Brush Development Co., Instrument Div., 64E, 3405 Perkins Ave., Cleveland 14, Ohio.

Moisture Measuring Device—Substantial time savings are claimed determining the moisture content of a wide variety of commodities, ranging from cereal grains to foundry sands and detergents, through a new instrument produced by Central Scientific Co. The device is said to detect the moisture content of a commodity in 5 to a maximum of 15 min. In operation, 5 g of the commodity to be tested are placed in a light aluminum pan inside the unit, then the infrared radiation is turned on, and finally, the weight of the moisture loss is shown by the torsion balance on a scale calibrated in percentage points.

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.

Entrained Air Indicator—An entrained air indicator, designed for faster and more accurate determinations of entrained air content in freshly mixed concrete, has been developed by the Central Scientific Co. Made of cast magnesium alloy, the new entrained air indicator is more durable than the former steel models and its lighter weight makes it more convenient for cement contractors to carry in the field.

Central Scientific Co., 1700 Irving Park Blvd., Chicago, Ill.

New Bridge Balance—A new 8-channel Bridge Balance, Type 8-108, has been added to the Consolidated line of recording measurement instruments and is now available. Highly flexible, the instrument may be used for direct recording of the output of a wide variety of strain gages and strain-gage type pickups without the use of amplifiers. New design features and controls combine extreme simplicity and a high degree of accuracy, it is stated. Used together with CEC's 5-114 or 5-116 Recording Oscillographs, the 8-108 offers a complete, relatively low cost recording measurement system. Styling and gray wrinkle finish match the Type 5-116 Oscillograph and Type 1-118 Carrier Amplifier.

Bulletin CEC 1530, Consolidated Engineering Corp., Pasadena, Calif.

Microscope Slide Cover Glasses—An outgrowth of the manufacture of thin ribbons of glass for electronic capacitors, is the successful production of large sheets of ribbon glass of suitable quality for use in the manufacture of microscope slide cover glasses, which was announced this month by Corning Glass Works' Laboratory and Pharmaceutical Sales Dept. The cover glasses are of uniform thickness and quality, are water-white crystal in color, and are said to offer a much higher degree of flatness than that attained in imported products.

Corning Glass Works, Corning, N. Y.

New Titrator—Fisher Scientific Co. announces a new improved instrument called the "Titrimeter" for Karl Fischer, micro, and other titrations. This electronic instrument for the quantitative determination of solutions features a completely new stand; improved stirrer and control box; and integral provisions for microtitrations and Karl Fischer moisture determinations. Titrations of the acid-base, oxidation-reduction, precipitation, and complex ion types can be conducted with greater accuracy, ease of operation, and speed than by any other known means, according to the manufacturer. Among the instrument's determinations: chromium, vanadium, manganese in steel; copper in brass, bronze, ores; zinc in alloys, ores, salts; iron in ores, alloys; titanium in pigments, ores, alloys, salts.

Fisher Scientific Co., 717 Forbes St., St., Pittsburgh 19, Pa.

Colorimeter and Turbidimeter—"Chromatron" Photoelectric Colorimeter and Turbidimeter—a colorimeter and turbidimeter for chemical analysis, process control, and product grading—has been announced by Hellige, Inc. It features selective color filters covering the entire visible spectrum, square and round absorption tubes, hermetically sealed photocell, extra large meter, and automatically focused bulb. Simple 3-step operation is said to give instantaneous, accurate readings. The instrument operates on all standard voltages and frequencies, as well as from two small dry-cell batteries for complete portability. It is said to be extremely sensitive to meet the highest requirements of laboratory accuracy, yet exceptionally rugged to withstand rough handling in the field or factory.

Hellige, Inc., 877 Stewart Ave., Garden City, N. Y.

Instrument Amplifier—Several refinements are announced in the Keithley Model 102 Phantom Repeater, an instrument amplifier with an extremely high input impedance. Improvements include reductions in input capacitance, and in power consumption. The instrument's input impedance is now greater than 200 megohms shunted by 6.0 mmf, and output impedance is within 350 ohms in series with 8 mfd. Features include gains of 1.0, 10, and 100; frequency response of 5 cps to over 150,000 cps.

Keithley Instruments, 3868 Carnegie Ave., Cleveland 15, Ohio.

Compression Tester for Testing Concrete Cylinders—To meet the demand for

compression testing of standard 6 by 12-in. and 8 by 16-in. concrete cylinder specimens on the job, Tinius Olsen Testing Machine Co. offers a compact, portable unit. The specimen is placed between two compression surfaces, the upper of which is self aligning to assure accuracy. The load is applied by a hand piston pump; and loads are indicated on a gage provided with a maximum load pointer. The standard gage indicates loads from 30,000 to 300,000 lb. Metric scale is also available.

Tinius Olsen Testing Machine Co., 1152 Easton Rd., Willow Grove, Pa.

Spectrum Analyzer—A new all band direct reading spectrum analyzer, covering the frequency range from 10 to 21,000 mc has been announced. This frequency range is covered by means of four tuning units. Its features include continuous unidial tuning over the entire range with 5-kc resolution at all frequencies. The frequency can be read to an accuracy of one per cent and dispersion is independent of frequency and available from 250 kc to 25 mc. A frequency marker is provided to measure frequency differences from 0 to 25 mc.

Polarad Electronics Corp., 100 Metropolitan Ave., Brooklyn 11, N. Y.

Double Rheostat—A group of Double Rheostats are now available for 1120, 1560, and 2000 w capacity. Two tubes of the same length are mounted between sturdy mounting brackets, while only one slider moves a double contact arm with double copper-graphite contact brushes. These models have two ranges connecting both tubes in series or in parallel.

Rex Rheostat Co., Baldwin, L. I., N. Y.

Ultracentrifuge Batch Rotor—Batch samples as large as 1600 ml can be ultracentrifuged up to 20,000 rpm under controlled temperature conditions in a new bowl-type rotor designed for use with the "Spinco Model L Preparative Ultracentrifuge." At this speed the material is subjected to maximum and minimum centrifugal forces of 43,380 and 16,770 times gravity, respectively. The rotor has been designed to speed up preparative runs on sedimenting materials which pack readily—particularly those forming gelatinous precipitates; and lends itself to materials which are infectious or require sterile handling. The rotor is so designed that all parts can be sterilized.

Specialized Instruments Corp., 662 O'Neill Ave., Belmont, Calif.

Vacuum Gage—A new gage, Type PHG-09, which covers a range of 8,000,000:1 on a single meter from a single pickup has just been announced by the Distillation Products Industries division of the Eastman Kodak Co. This new gauge, the company announced, can be used to read vacuums from 0.50 to 10^{-7} mm Hg. The all-metal pickup tube which handles this range works on the glow discharge principle. In the tube, permanent magnets provide a field which lengthens the electron paths into tight spirals that give high ionization per electron, with a cascade effect. Having no filament to burn out, the new tube can be operated at full atmosphere without damage. In addition, the circuit is insensitive to fluctuations in line voltage. Another advantage of the new gage is that because the magnets are external to the ionization chamber, there is no problem involved with outgassing the magnets or removing stray iron particles. Furthermore, the tube is automatically self-cleaning because when operated at the higher pressures in the lowest sensitivity range, it rids itself of deposited film.

Vacuum Equipment Dept., Distillation Products Industries, Ridge Rd. West, Rochester 3, N. Y.

Catalogs and Literature

Electrolytic Polishing—A bulletin is offered providing information on the theory and practice of electrolytic polishing of metallurgical samples together with description of the No. 1700 AB Electro Polisher.

Buehler Ltd., 165 W. Wacker Dr., Chicago 1, Ill.

Testing Machines—Eight-page folder illustrating current Amsler machines for tests in tension, compression, torsion, shear, fatigue, bending, and ductility. Separate bulletins available on wear testing, and testing of miniature samples.

Buehler Ltd., 165 W. Wacker Dr., Chicago 1, Ill.

Optical Gaging—A new publication, "Optical Gaging," which describes some of the more recent developments in optical gaging is now being distributed by the Eastman Kodak Co. The paper points out that accuracy, speed, and economy may all be achieved in modern production gaging and inspection through the use of optical gaging techniques. There are descriptions of the elements of an optical gage and the charts used in inspection. Staging fixture principles and desirable characteristics in an optical gaging projector are outlined.

Eastman Kodak Co., Industrial Optical Sales Div., Rochester 4, N. Y.

Air Pumps—A new bulletin on Eberbach air pressure or vacuum pumps designed for laboratory applications has been published. Available upon request, this attractive bulletin gives complete performance and size specifications, suggested uses and illustrated descriptions of the unmounted and motor-mounted models.

Eberbach Corp., Ann Arbor, Mich.

Bubble Viscometers—A new brochure published by Gardner Laboratory, Inc., describes and illustrates the Bubble Viscometers available from that firm. These viscometers are described as being rapid reading and the method employed is said to eliminate frequent restandardization. The viscometers are said to be in accordance with ASTM D 154. Five series of viscometer tubes are available: extremely light bodied lacquer series, varnish series, heavy bodied series, rubber series, and lithographic series. The brochure lists prices for each series as well as prices for replacement tubes. Also described are two tube holders used with the viscosity tubes.

Gardner Laboratory, Inc., Bethesda 14, Md.

Recorders and Controllers—To describe how "Speedomax" recorders and controllers are being applied to a variety of uses in industrial production and research, Leeds & Northrup Co. has just published a revised, 48-page edition of its catalog—"Speedomax Type G Instruments for Measurement and Control." The publication has been expanded to include numerous installation pictures of Speedomax instruments in plant and laboratory, as well as specifications for the latest additions to the Speedomax line.

Catalog ND46(1), Leeds & Northrup Co., 4934 Stenton Ave., Phila. 44, Pa.

Hydraulic Universal Testing Machines—Olsen "L" type hydraulic testing machines in 5 capacities from 60,000 to and including 400,000 lb are described in Bulletin 44 recently published. Operating details of these low-cost machines, which are intended for use on standard specimens, are included together with specifications.

Tinius Olsen Testing Machine Co., 1152 Easton Rd., Willow Grove, Pa.

Oxygen Bomb Sulfur Apparatus—A new four-page bulletin describes Parr oxygen bomb sulfur apparatus for determining sulfur and other elements in solid or liquid combustible materials, such as coal, coke, and petroleum products. The apparatus is described as being suitable for use in ASTM D 271, D 129, D 808, and D 833.

Parr Instrument Co., 211 53rd St., Moline, Ill.

Portable X-Ray Machine—A new eight-page brochure describes a new lightweight portable 260-kvp industrial X-ray machine. The instrument, called the Model 49-1, eliminates the need for difficult setups and costly rigging for X-ray inspection.

Triplett & Barton, Inc., P.O. Box 3128, Burbank, Calif.

Special Glassware—"Scientific Glassware to Your Own Sketch," is a 12-page brochure, illustrated with drawings and pictures, which presents data, specifications, and prices on special scientific glassware, scintillating crystals, special chemicals and gases. A special feature is a "sketch sheet" on which any special scientific glassware item may be sketched and mailed to the company for quotation.

Wakefield Industries, Inc., 5108 Grove St., Skokie, Ill.

Instrument Company News

Central Scientific Co., Chicago, Ill.—Scholarships offered annually for graduate study in the physical sciences by Central Scientific Co. have been awarded for the academic year 1952–1953. The $1000 scholarship was won by Albert J. Rothman who is studying for his Ph.D. degree under the supervision of Prof. LeRoy A. Bromley, Dept., of Chemistry, University of California, Berkeley. The $1500 scholarship was awarded to William F. Miller studying for the Ph.D. degree at Purdue University under the direction of Prof. Robert L. Platzman, Dept. of Physics.

Consolidated Engineering Corp., Pasadena 8, Calif.—The formation of a new corporation, CEC Instruments, Inc., as a subsidiary organization to handle sales and service work on instruments manufactured by Consolidated Engineering Corp., was announced by the firm today. Direct consultation and efficient service on Consolidated's steadily expanding line of instruments will be the main objective of CEC Instruments, Inc., according to Consolidated representatives. Because of the increase in production of its instruments, the company felt the need for an organiza-

tion of qualified engineers who could cope with the application and operational problems of individual clients and would be more quickly available than they possibly can be when routed from the Pasadena office.

Corning Glass Works, Corning, N. Y.—The appointment of George Norman as Sales Manager of Corning Glass Works' New Products Division has been announced by T. H. Truslow, Division Manager. Mr. Norman comes to Corning from Aerovox Corp. of New Bedford, Mass., where he was Chief Engineer of that company's Mica Div. for the past seven years.

Glass Engineering Laboratories, Belmont, Calif., opens a branch location at 6309 S. Broadway, Los Angeles. This operation, under the supervision of Robert Davis, will distribute Glenlab specialized glass apparatus and Corning industrial glass piping and will maintain stocks of the piping and accessories.

Arthur S. LaPine & Co., Chicago, Ill., announces the opening of their new plant at 6001 S. Knox Ave., Chicago 29, Ill. This new 37,000-sq ft completely modern plant contains a large laboratory which has facilities for customer's use for testing and inspection of new equipment, and a complete machine shop for manufacture and repair of scientific equipment.

Leeds & Northrup Co., Philadelphia, Pa.—The purchase of a 125-acre tract of land at North Wales, Pa., in the Philadelphia suburban area, has been announced by Leeds & Northrup Co., manufacturer of electrical measuring instruments, automatic controls, and heat-treating furnaces. Although ultimate use of the tract remains to be determined by engineering surveys, according to C. S. Redding, President, the company contemplates moving to the new location certain operational or laboratory units from its main plant in Philadelphia.

Lindberg Engineering Co., Chicago, Ill., manufacturers of a wide variety of industrial products and heating equipment, have just announced an increase of their manufacturing facilities. With the opening of Lindberg Plant No. 2, additional 6200 sq ft of production space are now available. Lindberg Plant No. 2 at 2317 Grand Ave. will manufacture laboratory furnaces, small induction heating units, Fisher type melting furnaces and atmosphere generators, thereby relieving the main plant to speed up production of large industrial heat-treating furnaces.

Annual Meeting of AIC

THE American Institute of Chemists held its 29th annual meeting at the Hotel Commodore, New York City, May 7–8. At the annual business meeting for the election of officers and councilors, the retiring president, L. H. Flett, spoke on the subject, "As the Institute Stands Today." Dr. Lincoln T. Work was introduced as the incoming president. That afternoon three sessions were held concurrently entitled "Recent Progress," "Public Relations for the Chemist," and "The Situation in Chemical Literature." The members and visitors also had the opportunity to attend sessions on "Employer-Employee Relations" or "Industrial Safety and Hygiene." A general session was held on the subject, "Chemical Research—Management Viewpoint."

The annual banquet had as its toastmaster, Dr. S. D. Kirkpatrick, Editorial Director, *Chemical Engineering* and *Chemical Week*. The retiring president, L. H. Flett, spoke on "The Bright Day of Chemistry," and an honorary membership certificate was presented to the incoming president, Dr. Work. Presentation of the Gold Medal Award was made by Dr. Harry L. Fisher, Chairman of the Jury of Medal Award, AIC, and the Medal acceptance address was made by Dr. Fred J. Emmerich, President, Allied Chemical & Dye Corp.

Aging Effect on Regularly Hydrated Dolomitic Lime Putties

REGULARLY hydrated dolomitic limes have been used extensively in the preparation of white-coat plaster. These finishing hydrated limes are potentially unsound, because they contain magnesia which may hydrate subsequently in the set plaster and result in disruptive expansion.

A new publication "Effect of Aging on the Soundness of Regularly Hydrated Dolomitic Lime Putties," reports a National Bureau of Standards investigation to determine whether potentially unsound regularly hydrated dolomitic lime can be rendered sound by soaking as a putty for a reasonable length of time.

The progressive hydration of magnesia upon aging and the decrease in autoclave linear expansion were studied for 18 regularly hydrated dolomitic limes representative of commercial production. When the expansion had been reduced to 1 per cent, a suggested specification limit, the proportion of total magnesia hydrated for the different limes ranged from 83 to more than 97 per cent. The aging period required to effect the reduction in expansion varied from a minimum of 3 to more than 32 weeks. Since long and variable aging periods are impractical, the types of lime that give satisfactory performance are discussed for the benefit of the architect, engineer, contractor, plasterer, and others interested.

Army Engineers Sponsor Two-Day Conference on Materials and Design for Low-Temperature Service

AN IMPORTANT advance in the solution of the "Arctic Problem" was made at a two-day conference on materials and design for low-temperature service held recently at the Engineer Research and Development Laboratories, Fort Belvoir, Va.

For the first time a comprehensive correlation was made of the data currently available on low-temperature properties of metals and on designs suitable for Arctic operation. Such a correlation, by pointing up the gaps in present knowledge, will serve as a guide to further research. It will also supplement engineering handbooks which contain little or no scientific or engineering data on this subject.

Since the "Arctic Problem," involving as it does the design and modification of equipment for low-temperature use, is today an important factor in national defense, the conference occasioned nationwide interest. Experts from the armed services, government, and industry participated. The conference was sponsored by the Engineer Research and Development Laboratories' Scientific Council. Cooperating with the Council were Ordnance, Naval Research Laboratory, National Bureau of Standards, and other government agencies, as well as industrial and research organizations.

The first day was devoted to consideration of ferrous base metals, including ship plate. Twelve speakers were heard on this topic. On the second day, low-temperature properties and applications of non-ferrous metals were discussed by eight speakers. Also heard were four speakers on general topics relating to low-temperature studies.

Moderators were F. B. Foley of the International Nickel Co., New York; Dr. Finn Jonassen, NRC, Ships Structure Committee, Washington, D. C., and Dr. J. G. Thompson and T. G. Digges, both of the National Bureau of Standards.

The results of the conference will be published by the Office of Technical Information, Department of Commerce, and furnished at cost. Those interested in receiving the publication should write to A. L. Tarr at the Technical Service Dept., ERDL, Fort Belvoir, Va.

It is the engineer's responsibility to take the new research discoveries as they come along and to put them to work for the benefit of man, and to find ways of doing it that industry and the people can afford.—Harry A. Winne, Vice-President, Engineering, General Electric Co.

—G.E. Review

"Some Gratifying Results"

Annual Address by the President

T. S. Fuller,[1] June 24, 1952

I AM happy today to note so many of our friends from foreign lands participating in this the Fifty-Fifth Annual Meeting of our Society and the fiftieth Annual Meeting since incorporation. Let me assure our guests that they are most welcome.

The American Society for Testing Materials was legally incorporated, through the granting of a charter, on June 3, 1902, under the laws of the Commonwealth of Pennsylvania, and this charter was unanimously adopted by the membership at the Fifth Annual Meeting held June 12–14 at Atlantic City.

All things are temporal. We have been privileged to live in a period of rapid change and great progress in many ways. Fifty years ago few homes enjoyed telephones and electric lights, and none of us at that time, of course, were tempted to while away our time with radio and television programs. Automatic heating and air conditioning of homes were nonexistent.

Populationwise the United States has increased from 76,094,134 to 150,697,000, the national income from $88,517,000,000 to $239,000,000,000, and the national debt from $1,263,000,000, or $16.50 per capita, to $257,357,000,000, or $1696 per capita.

Whether or not all of these items indicate progress may well be a matter of opinion and a subject for debate. They do, however, provide substantial proof of the great changes—social, economic, and technical—which have taken place over the 50-year period.

In 1902 our Society had been in active existence for four years as the American Section of the International Association for Testing Materials. During the Society's third Annual Meeting, October 25-26-27, 1900, the Chairman, Professor Mansfield Merriman, as pointed out in the October, 1951, BULLETIN, spoke forthrightly of his dissatisfaction with the then existing conditions. Professor Merriman said in part—"It may here be plainly stated that the policy of the International Association in regard to publications is not satisfactory to many American members. The proceedings of the Council meetings are not published, no financial statements are given out, and practically nothing is known of the work of the technical committees." After discussing further details of the publication problem, Professor Merriman said "In addition to the above I have to acknowledge the receipt, on July 27, 1900, of a typewritten copy of the minutes of the Council meeting held ten months previously, namely, on September 25 and 26, 1899.

"Attention may also properly be called to the fact that no statements regarding the expenditures of the Association have even been made, as far as I am able to learn. As the American Section has regularly transmitted to the International Council $1.50 per year for each of its members, it would seem that such statements are due us. In my opinion it becomes a question to be carefully considered as to whether this state of affairs ought to be continued indefinitely."

Well and forcibly did Professor Merriman express his concern over the then-existing conditions. Well did his colleagues respond, and well have Professor Merriman's successors carried the torch down through the ensuing 50 years, opening new avenues of knowledge along the way and well will future generations carry on the work of our Society into paths now unknown, because the work of groups such as ours, founded on sound principles and with worthy aims, can never be retarded but must continue toward the ultimate goal always to be approached but never to be attained.

The first proposed specification of our Society was issued in 1900 and adopted in 1901 and covered steel for bridges and ships, buildings, boiler plates and rivet steels, rails, splice bars, axles, steel ties, forgings, castings, and wrought irons. Today we have 1800 standards comprising 10,000 pages and printed in eight volumes.

In 1901, the roll of members included 168 names. Today, 51 years later, we find a membership of over 7000.

The first technical committee, A-1 on Steel, was organized in 1898. Fifty-four years later the Year Book shows 74 technical committees and 1120 subcommittees and subgroups. One but has to turn each year to the annual report of the Board of Directors for a complete statement of our Society's financial position. These data offer eloquent testimony to the excellence of Professor Merriman's judgment in 1902.

The first standards approved by our Society were concerned with metals. In 1902 there were 10 such standards. Ten years later, in 1912, there were 50 standards dealing with metals and 12 concerned with nonmetallics, or a ratio of approximately 4:1 in favor of the metals. In 1952, however, the situation has changed to the point where there are 526 metallic standards and 1284 dealing with nonmetallics or a shift in the ratio to 1:2.4 in favor of the nonmetallics.

Thus did our Society at the outset concern itself with the properties of metals. However, just as science has reached out into new fields, so has our Society correspondingly broadened its scope, to the end that specifications and methods of test for all types of materials used by modern industry have been provided.

These most gratifying results of

[1] Engineer in Charge of Works Laboratory, General Electric Co., Schenectady, N. Y.

our Society have been made possible by the committee organization of the type now in use. As each of you so well know, each committee provides an open forum where producers and consumers meet for discussion and solution of problems of mutual concern. No other type of organization could, in my opinion, function so well.

The 50-year period with which we are concerned today has witnessed remarkable improvement in the science of testing. In the early 1900's engineering concepts and the materials then existent made necessary the use of low design stresses. As new materials became available and as the complexity of the information required by the engineering profession, increased, so did the philosophy of testing change to keep abreast of the demands.

Two phases, namely, the evaluation of materials and the control of quality, are involved in the science of testing. The evaluation of the properties of materials requires research and development programs which may extend over considerable periods of time. Control of quality, because of the volume of material involved, must be accomplished by reasonably short-time tests. It has been in the interest of saving time that many of the improvements in testing machines have been added.

The autographic and recording devices and other refinements have greatly facilitated the accuracy and convenience of the Universal Testing Machine.

Many modern engineering designs require information on high temperature, tensile, creep, rupture, and fatigue properties of metals. Others call for information on these same properties at extremely low temperatures.

Non-destructive testing, which was practically non-existent fifty years ago, is essential to modern technology. Radiography, magnetic particle testing, and examination by ultrasonic means constitute extremely important activities of many laboratories.

The versatility of the ultrasonic test is apparent when it is realized that, like its counterpart, radar, an ultrasonic beam can be made to travel in a direction perpendicular to the surface of the object, angularly through the object, or along the surface. The frequency of the ultrasonic vibration can be varied over wide limits—for example, one-half to five megacycles—and thus in itself act as a selector to detect flaws of a given magnitude. The ability of most materials to conduct sound easily permits inspection of material irrespective of size or thickness. The ability of flaws to reflect the high-frequency sound beam back to the source permits internal inspection to be carried out from that surface which is particularly convenient to the operator.

The application of this versatile tool has made possible the examination of the internal condition of wrought parts with the same thoroughness that has been used for years in the X-raying of cast parts.

The crystal balls of history, with the exception of those of Jules Verne and Leonardo da Vinci, have not been noted for accuracy. Statistically the odds are overwhelmingly discouraging toward any prediction which I might venture. Consequently, I shall adhere strictly to the projection of current activities at current rates of increase. By so doing one comes up with numbers of imposing proportions, and one wonders how executives of the 2000 A.D. era will cope with the problems of finance and printing.

The annual budget on which the Society is currently operating is $629,000.

The receipts of the Society in 1902 were $408 and the disbursements $609. A previous cash balance, however, helped out, leaving a cash balance in June, 1902, of $87. As of the same date, however, an unpaid bill item of $91 must have been very disturbing to the auditors. On March 8, 1902, the Acting Secretary was authorized to spend a sum not exceeding $25 per month for clerical assistance.

Should the rate of increase of the annual operating expenses, which has been in effect for the past ten years, continue, such expenses at the end of another half century would be of the order of 2.3 million. Unfortunately the measuring stick, the dollar, has been very unstable during this ten-year period, having depreciated during that time by 43 per cent. Perhaps one of the most important services which this society might attempt to perform would be to assist in the evolution of a standard dollar.

Applying the same line of reasoning to the number of standards and number of pages embodied in those standards, 50 years hence there will be 4600 standards requiring 28,000 pages.

Judging by past performance, the number of members in the year 2002 will be 18,000.

However, it is not merely the matter of physical growth which is of consequence. These growths are a measure, a means perhaps, of evaluating what is even more significant—the importance of the Society's role in the nation's economy today. I very much doubt if our founding fathers, even though they recognized the importance of standard specifications when they set up the new American Society for Testing Materials, had any inkling of how important a part the Society would play or the recognized position it would take. I look for the further enhancement of that position in our free economy.

Most certainly the most important problem facing the world today involves a search for a means of providing mutual understanding among nations, yes among all the peoples of the earth, that they may live together in harmony and peace. This problem is as old as the world and perhaps it may never be solved, but we have the right to hope, and it seems to me that there is a potential opportunity for good for a better understanding among people through "standardization."

It has been my privilege to have met many engineers from foreign lands who have been intensely interested in "standardization," and I have found them, with few exceptions, to be the same kind of persons we are in ASTM. They think as we do and their interests are similar. They smoke the same kind of tobacco and have the same virtues and the same sins.

So in bringing this brief address to a close, I appeal to engineers of all lands, because of their mutuality of interests, to work for understanding not only in the field of standardization but also in politics, economics, and all other fields, to the end that our hope, that we may contribute our "widow's mite" to a permanent peace, may be nearer justification.

The Effect of Shot Peening on Damage Caused by Cavitation

By Nicholas Grossman[1]

SYNOPSIS

Cavitation in a liquid may result from rapid relative motion between the metal and the liquid, for if the pressure accompanying this high velocity drops to the vapor pressure of the liquid, the liquid will vaporize and form a vapor cavity. The collapse of this bubble will cause a concentrated liquid impact resulting in erosion and pitting of the metal surfaces. The designer of hydraulic machinery tries to eliminate this hazard by proper design. In many cases, however, the operating conditions are such that higher efficiency or better economy is attained by operating near cavitation conditions, or even with occasional cavitation present. The task of the designer then becomes in addition to proper design the selection of a suitable material that will be less susceptible to cavitation damage. In the present study the effect of shot peening on the rate of cavitation damage was investigated. Two steels and one brass were tested. It was found that the damage, as measured by the rate of weight loss per unit time, was decreased by shot peening. The amount of decrease varied from 7 to 58 per cent for the different materials.

CAVITATION in a liquid may result from rapid relative motion between the metal and the liquid, for if the pressure accompanying this high velocity drops to the vapor pressure—corresponding to the temperature of the liquid—the liquid will vaporize and form a vapor cavity. At a slight increase in pressure this bubble will collapse and will cause a concentrated liquid impact. Thus cavitation is essentially a phenomenon due to instability. This sudden shock loading will cause erosion and pitting of the metal surfaces, and once initiated, it becomes progressive and cumulative.

The designer of hydraulic machinery tries to eliminate this hazard by proper design. In many cases, however, the operating conditions are such that higher efficiency and better economy are more readily attained by operating near cavitation conditions, or even with occasional cavitation present (1, 2)[2]. It is well worth differentiating between the *micro-mechanism* of cavitation which is a hydrodynamic phenomenon and the resultant macroscopic *damage*, which is a combination of fatigue, erosion, corrosion, and pitting. This paper deals only with the latter aspect of cavitation.

The purpose of the present study is to investigate whether the effects of cavitation damage could be mitigated by proper surface treatment of the machine parts or elements to be exposed to cavitation. Surface treatment of metals may be roughly divided into two categories: chemical (carburizing, nitriding, plating, anodizing, etc.) and physical (cold working, painting, other mechanical adhesive coverings). The choice of protective surface treatment is naturally a function of the particular design application as well as economic considerations. The beneficial effects of shot peening on the fatigue properties of metals are known (3), but no published reports have been found in the technical literature on the effect of cold working on the damage caused by cavitation. This paper describes a series of tests conducted to study the effects of shot peening on the damage caused by cavitation.

[1] On leave of absence from Massachusetts Institute of Technology, now at M. W. Kellogg, New York, N. Y.

NOTE.—DISCUSSION OF THIS PAPER IS INVITED, either for publication or for attention of the author. Address all communications to ASTM Headquarters, 1916 Race St., Philadelphia 3, Pa.

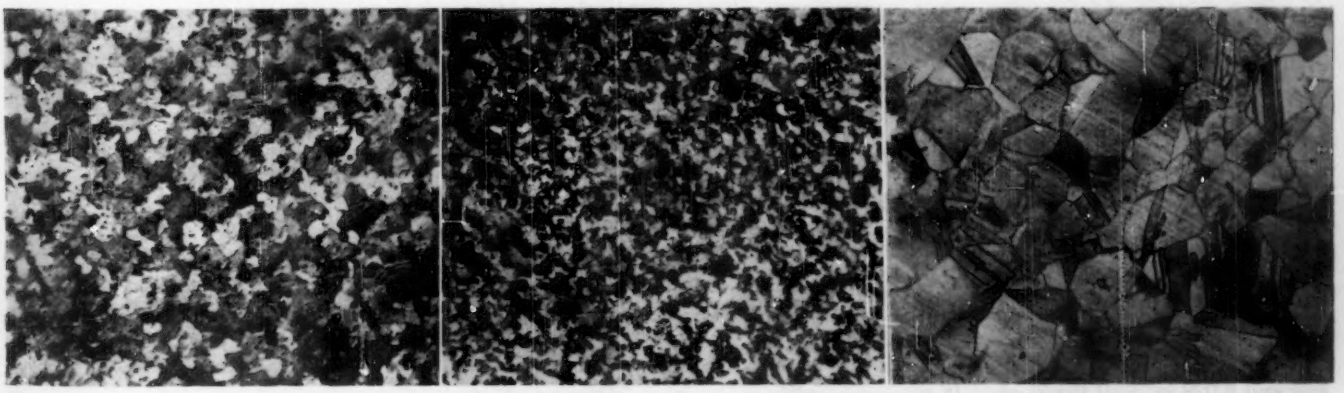
[2] The bold face numbers in parentheses refer to the list of references appended to this paper.

MATERIALS TESTED

SAE 1020 and 1045 steels and SAE 70C brass were tested. The steels were obtained in $\frac{3}{4}$-in. round, hot-rolled bars, fully killed quality. The steels were annealed before the machining of the test specimens. The brass specimens were obtained from a $\frac{1}{2}$-in. thick cold-rolled, half-hard plate, tested in the "as-received" condition. Chemical analysis and physical test data are listed in Table I. Representative photomicrographs are shown in Fig. 1. The dimensions of the test specimens are given in Fig. 2. The machined specimens were divided into two batches. One batch received no special surface treatment, and the surface to be exposed to cavitation was finished ground in the surface grinder. The second batch was mounted in a suitable holder and last shot peened. The pertinent data about the shot peening are presented in Table II.

APPARATUS AND INSTRUMENTS

Several types of laboratory apparatus have been devised by the investigators in order to simulate or duplicate the mechanical effects of cavitation. The



SAE 1020 steel, annealed; etched in 6 per cent nital. SAE 1045 steel, annealed; etched in 6 per cent nital. SAE 70C brass, as-received; 50 per cent ammonium hydroxide, 50 per cent hydrogen peroxide.

Fig. 1.—Photomicrographs of Materials Tested (× 100).

TABLE I.—CHEMICAL COMPOSITION, PER CENT, AND PHYSICAL TEST DATA OF MATERIALS TESTED.

Material	Carbon	Manganese	Phosphorus	Sulfur	Copper	Tin	Zinc	Lead	Iron	Yield Point, psi	Tensile Strength, psi	Elongation in 8 in., per cent	Vickers Hardness Number
SAE 1020.....	0.21	0.44	0.014	0.033	...	...	...	...	...	41 200	64 100	29.0	114[a]
SAE 1045.....	0.44	0.79	0.015	0.035	...	...	...	...	...	57 940	95 070	20.0	152[b]
SAE 70C.....	..	None	...	...	66.51	None	33.36	None	0.03	...	...	...	112

[a] Annealed at 1650 F.
[b] Annealed at 1550 F.

three basic types are the nozzle, vibrator, and impact.

In the nozzle type the liquid passes through a nozzle where it undergoes an increase in velocity and a corresponding reduction in pressure to below the vapor pressure. This causes the formation of bubbles. The test specimen is mounted at a point downstream where the collapse of the bubbles is taking place.

The vibratory apparatus utilizes the magnetostriction principle. A nickel tube is placed in a high-frequency magnetic field and is caused to oscillate at its natural frequency. The direction of vibration is normal to the face of the specimen.

The impact type of apparatus may be regarded as "simulated" cavitation condition since the impact or pressure waves are produced by a "hydraulic hammer" instead of collapsing bubbles.

The choice of testing apparatus is largely left to the investigator, because a comparison of results shows that there is the same general order of cavitation damage for different materials irrespective of the test method employed (4).

In the present investigation, the vibratory type of apparatus was utilized. The chief advantages of this method are: small, inexpensive specimens; rapidly obtainable effects; good reproducibility. The testing equipment was designed and built at the Institute. In principle it is a nickel tube subjected to magnetostriction by an electromagnetic field tuned to the natural frequency of the tube itself (5). It is made of commercially hard-drawn nickel about 12 in. long by $\frac{5}{8}$ in. outside diameter and 0.028 in. wall thickness. It is supported in the vertical position by a metal ring silver-soldered around the center of gravity of the total mass. The total vibrating mass includes, in addition to the nickel tube, a nickel bushing in the lower end and the test specimen which is screwed into this lower bushing.

TABLE II.—SHOT-PEENING DATA.

Shot: S-230 Hard iron chilled—approximately 62 Rockwell C
Screen analysis:
High limit..... 0 per cent maximum retained on No. 18 screen
Nominal limit.. 70 per cent minimum retained on No. 30 screen
Low limit..... 20 per cent maximum passing No. 40 screen
Test strip: Almen "A" strip—49 Rockwell C
Nozzle: $\frac{1}{4}$ by $\frac{1}{2}$ in.; 6 in. from work; Injector type blast
Air pressure: 43 psi
Impact angle: 90 deg
Full saturation: obtained upon sixth pass

The principal parts of the setup include the container that holds the liquid in which the specimen is immersed, the supports that hold the nickel tube, the cooling system which maintains the nickel tube at near room temperature, an electronic circuit to produce the high-frequency electromagnetic field, an electric strain gage to measure the amplitude of vibration, and the auxiliary equipment used in the calibration of the instruments. The over-all photograph of the setup is shown in Fig. 3. A schematic diagram of the mechanical parts is given in Fig. 4, while Fig. 5 illustrates the general electronic wiring diagram.[3]

Testing Technique

The container in which the specimen is submerged is filled with distilled water at room temperature. A dummy specimen is vibrated for sufficient length of time to rid the liquid of as much absorbed gas as possible. The specimen to be tested is then cleaned in benzene and acetone, weighed on an analytical balance, and screwed tightly into the nickel tube. The specimen, and part of the tube, are then submerged in the distilled and degassed water, and the tube is caused to vibrate. An SR-4 electric strain gage is fastened onto the tube, and the resulting unbalance due to the rapid extension and contraction of the tube is detected and observed on an oscilloscope tube. (The amplitude of these vibrations can be measured by observing the motion of the specimen with a microscope under stroboscopic light.)

In the present investigation, the frequency and amplitude of vibration were kept constant, and the resultant weight loss measured at regular time intervals. While the data thus obtained may not be directly related to actual cavitation damage caused under a wide variety of conditions, with different liquids, specimen geometries, and other factors, they do serve as a qualitative measure in evaluating damage and quantitative tool in comparing the selected factors under study.

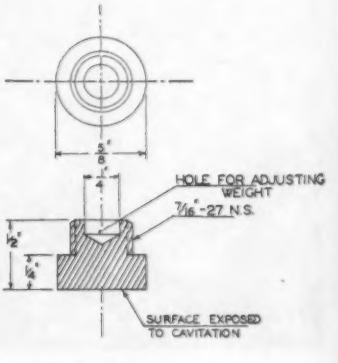
[3] The main features of the electronic circuit are a tuned amplifier with a driving coil L_1 (see Fig. 5), energized by the output of two UV-204A tubes, connected in push-pull, which are supplied by a power pack with a Variac Transformer for control. In addition to the input from the plate circuit of the tubes, which averages about 2000 v alternating current under normal conditions, this coil is polarized by 110 v direct current. A feedback coil, L_2, is connected in the grid circuit. The tube itself is the oscillator in resonance with the tank circuit composed of L_1 and C_1 as shown in Fig. 5 (6).

Results

Three metals—two plain carbon steels, and one brass—were tested to determine the effects of cold working on the resistance to cavitation damage. First a number of trial specimens of each material were tested to determine the suitable time intervals for measuring the resulting weight losses and to establish an optimum total testing time. These trial runs also served as checks on subsequent runs. After running one complete set of tests, a second set for one material was run, as a further check. The results are given in Table III. The plotted curves are shown in Fig. 6. As may be seen from these curves, there is the first stage of damage initiation after which the rate of weight loss appears essentially unchanged. The rate of damage as measured from the slopes of curves in Fig. 6 is given in Table IV. Figure 7 illustrates the physical appearance of the damage.

Several auxiliary measurements were made to gain additional information about the physical aspects of the damage. These are enumerated below.

The average Vickers hardness numbers are listed in Table I; a diamond pyramid indenter with a 30-kg load and $1\frac{1}{2}$-in. objective was used.



WEIGHT OF SPECIMEN = 13.0 ± 1.0 g

Fig. 2.—Dimensions of Cavitation Test Specimen.

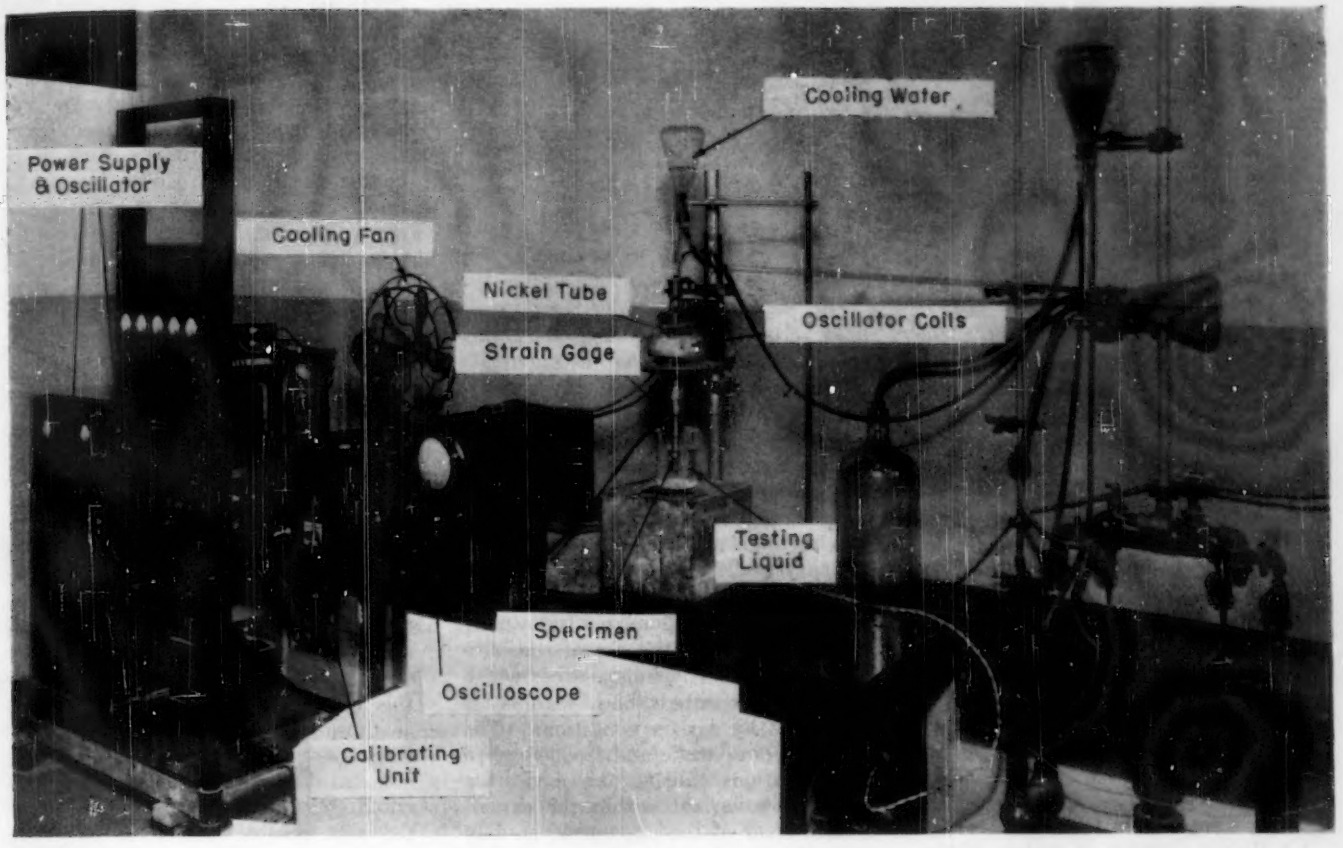


Fig. 3.—Over-all View of Testing Setup.

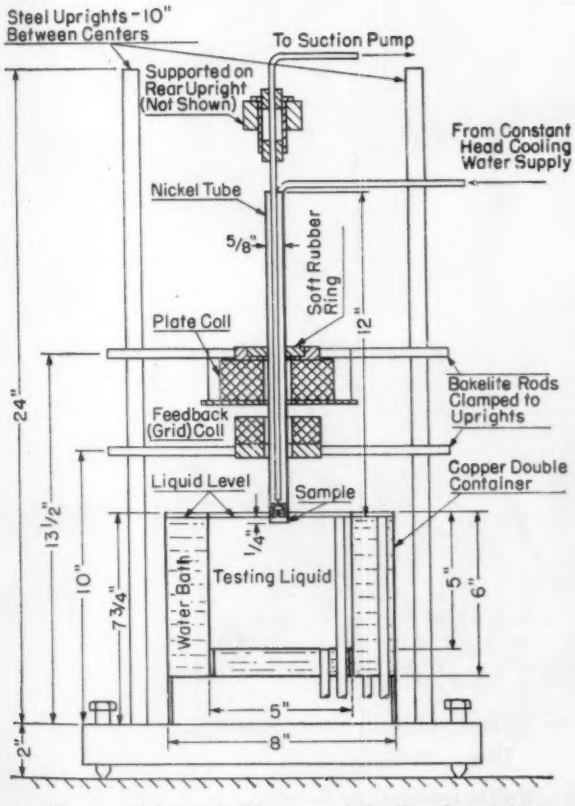


Fig. 4.—Schematic Diagram of Testing Apparatus.

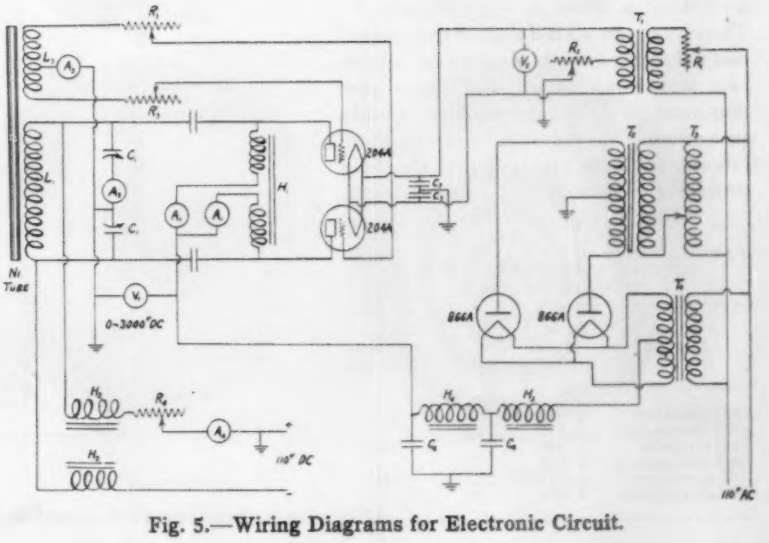


Fig. 5.—Wiring Diagrams for Electronic Circuit.

TABLE III.—RESULTS.

Specimen	Description	Weight Loss, g						
Time Specimens Were Exposed to Cavitation Damage, Min		0	30	60	90	120	150	180
No. 3	1020 annealed	0	0.0019	0.0099	0.0181	0.0248	0.0330	.....
No. 2	1020 shot peened	0	0.0025	0.0068	0.0110	0.0163	0.0209	.....
[a] No. 15	1045 annealed	0	0.0019	0.0032	0.0060	0.0078	0.0101	0.0123
No. 12	1045 shot peened	0	0.0019	0.0037	0.0057	0.0078	0.0104	0.0124
No. 21	70C as received	0	0.0033	0.0093	0.0180	0.0274	0.0347	.....
No. 26	70C shot peened	0	0.0024	0.0059	0.0093	0.0131	0.0167	.....
[a] No. 13	1045 annealed	0	0.0008	0.0022	0.0038	0.0061	0.0094	0.0122
No. 14	1045 shot peened	0	0.0026	0.0040	0.0066	0.0081	0.0104	0.0127

[a] Average values plotted on curves.

To obtain a relative evaluation of the surface conditions, profilometer readings were taken. A mechanical "Mototrace" with a total travel of $2\frac{1}{8}$ in. was used to insure uniformity in obtaining the measurements. The average readings for brass are listed in Table V.

To calculate the "pitting factor" the depth of the deepest pit resulting from cavitation was divided by the average penetration as computed from the weight loss. The geometry of the damage was assumed cylindrical, and the average diameter of the base circle was determined from Fig. 7 and taken as 0.30 in. Values of pitting factor are given in Table VI.

Discussion

Cavitation damage of metals is the composite result of repeated, intense shock loads concentrated on minute areas. This mechanical action is supplemented by electrochemical effects, especially in the presence of some corrosive medium. In the present test, the latter effects were minimized by the anaerobic distilled water used for the testing liquid and by the relatively short time of immersion of the metal specimens in the liquid. The only question that may arise is the relative effect of cold working (as introduced by shot peening) on the corrosion of metals. According to previous tests, the effect of cold working on the corrosion of copper and steel in water is insignificant (7). Thus it may be stated that in the present tests the mechanical aspects of cavitation were emphasized and made predominant. Judicious caution should be exercised, however, in applying these laboratory data to engineering field problems, where cavitation conditions may be quite different from those presented in these controlled tests.

The shot-peened metal layer introduces a highly stressed surface skin which tends to increase fatigue life (3). It also changes the surface roughness; the range of variation of the root-mean-square roughness due to shot peening was about sevenfold (see Table V). In ordinary cyclic tests, the surface conditions of the metal have a paramount significance on the fatigue life. In the present tests, however, the size of the bubbles, the sudden collapse of which causes the repeated shock loading, is unaffected by surface conditions. The intensity (amplitude and frequency) of the vibrations causing the cavitation was kept invariant within the experimental error of the apparatus, as may be confirmed from the resulting damage areas (see Fig. 7). No provisions were made to control the grain size, and while the comparison of the different metals is used more or less qualitatively, the question arises whether shot-peening, resulting in a distorted metal layer, was not a secondary cause and the differential grain size the primary cause in affecting the damage caused by cavitation. Previous tests conducted to study the effects of grain size on cavitation damage of a single phase metal indicated that the grain size is unimportant (6). It may be concluded that in the present investigation all the attributive factors were either eliminated or kept invariant throughout the tests, isolating the sole factor (that is, shot peening) to be observed and measured.

The mechanism of cavitation damage (in the present experimental setup) seems to have two phases: initiation and propagation of damage. In the first stage the total specimen area to be attacked by the cavitation takes form and the original surface layer is broken down. While the results obtained in this initial stage are just as reproducible as those in secondary stage, the first stage is essentially an unstable phenomenon and it may involve secondary contributory effects. In the evaluation of the test results, therefore, only the second, or steady state of damage propagation should be considered and meas-

TABLE IV.—RATE OF CAVITATION DAMAGE FOR MATERIALS TESTED.
(Obtained from Fig. 5.)

Material	Rate of Loss, g per hr	Per cent Decrease in Rate of Loss	Vickers Hardness Number
1020 annealed	0.0156	..	114
1020 shot peened	0.091	42	...
1045 annealed	0.046	..	152
1045 shot peened	0.043	7	...
70C as received	0.174	..	112
70C shot peened	0.074	58	...

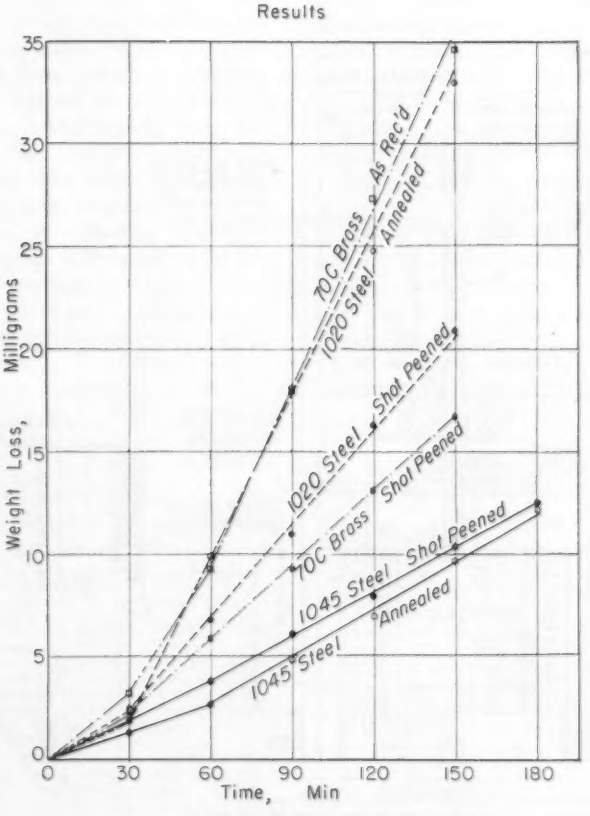


Fig. 6.—Weight Loss - Time Results.

ured. The slopes of the damage lines, plotted as weight loss against time exposed to cavitation, were calculated for the *secondary stage only* (Fig. 5) and listed in Table IV. It may be observed that in all cases *shot peening increased the resistance to cavitation damage* for the specimens tested. The decrease in damage, expressed as a percentage weight loss, varied from 58 per cent for brass to 7 per cent for 0.45 per cent carbon steel. While the total number of specimens as well as the metals studied are insufficient to draw any specific correlation between the decrease in damage and other properties, the relative hardnesses may point toward some explanation. Since shot peening, which is a form of cold-working, introduces a highly stressed and hardened surface layer, the relative workability and resulting hardening—keeping the intensity and length of peening unchanged—will be a function of the original hardness of the metal. In other words the effectiveness of a given shot-peening operation will be dependent upon the physical properties of the metal to be tested, and if shot peening is to be used to reduce effectively the damage caused by cavitation (the design permitting shot-peened surfaces) the degree of peening has to be established for every metal.

TABLE V.—SURFACE ROUGHNESS MEASUREMENTS FOR BRASS.

	Range of Profilometer Readings, microinch, root-mean square
As received..	16 to 23
Shot peened..	18 to 70

TABLE VI.—PITTING FACTORS FOR STEEL.

Specimen	Description	Deepest Penetration, in.	Average Penetration Over Damaged Area, in.	Pitting Factor
No. 3.....	1020 annealed	0.0166[a]	0.0097	1.7
No. 2.....	1020 shot peened	0.0176[a]	0.0062	2.8
No. 13....	1045 annealed	0.0115[b]	0.0036	3.2
No. 14....	1045 shot peened	0.0121[b]	0.0037	3.3

[a] 150 min test duration.
[b] 180 min test duration.

It is noteworthy to observe the deepest penetration in the specimens. As is to be expected, the most intense cavitation takes place around the axis of the vibrating tube and specimen, and while the damage seems to taper off gradually from the center to the periphery there are always a few relatively deep cavities present. After the conclusion of the tests a number of specimens were arbitrarily selected and the deepest penetration measured by determining the height of the specimens as tested, placing them in a surface grinder and removing all but the last trace of damage, and then measuring their heights again. This deepest penetration was more than 0.01 in. in every specimen thus measured. It is interesting to compare this value with the effective depth of shot peening which was estimated (under comparable conditions) at around 0.006 in. (8). Also notice that the average penetration could also exceed this 0.006-in. deep work-hardened layer (see Table VI) without any noticeable effect on the cavitation damage rate.

The yield point of SAE 1045 is higher than that of SAE 1020 steel or SAE 70C brass, so that the deformation produced by the impacts is less and there is less opportunity for a breaking of bonds. The rate of damage is therefore lower for SAE 1045. It may be worth while in some future investigation to find a more quantitative correlation between penetration due to cavitation damage and the depth of surface layer affected by shot blasting.

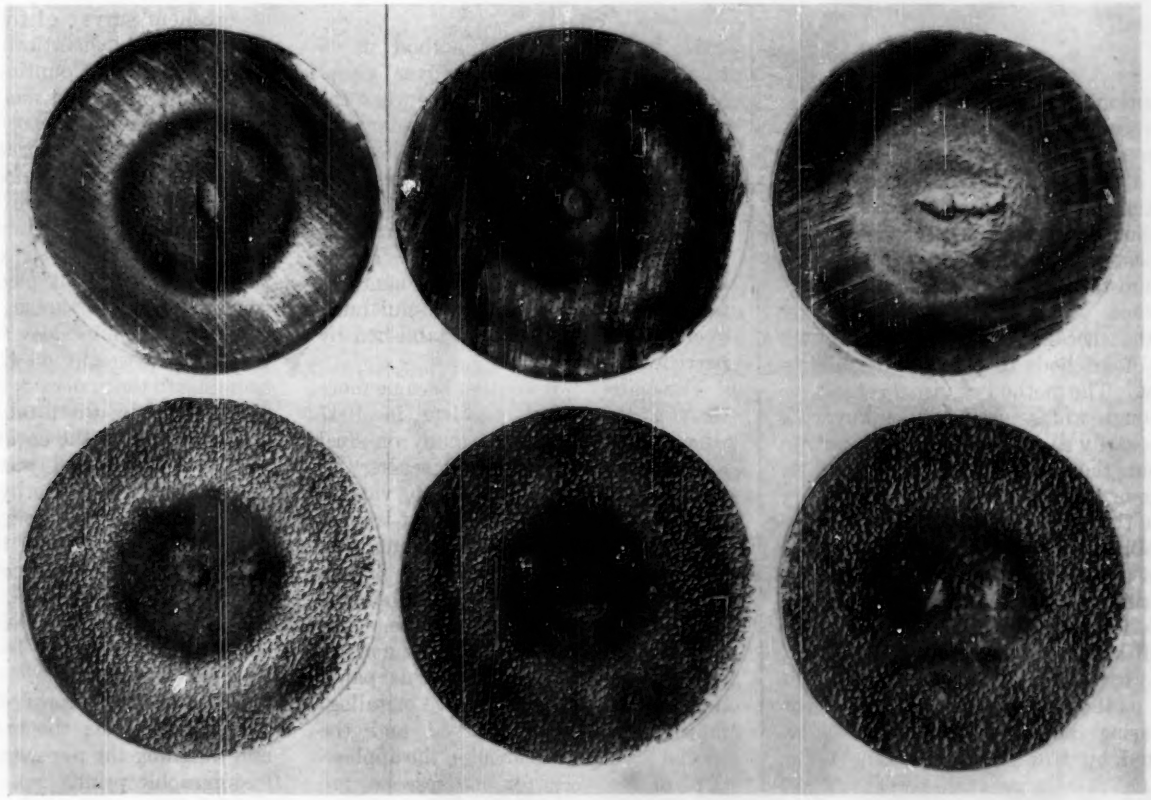


Fig. 7.—Physical Appearance of Cavitation Damage (× 3).

Conclusions

It was found that the rate of cavitation damage as measured by weight loss per unit time was decreased by shot peening. The amount of decrease varied from 7 per cent for SAE 1045 steel to 58 per cent for SAE 70C brass.

The effect of shot peening is to raise the yield point of the surface material without breaking any bonds. The greatest improvement is naturally noted for the initial softest materials, provided that they can be work hardened.

Acknowledgment:

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Quantitative Metallography with the Electron Microscope

By Alfred L. Ellis[1] and F. K. Iverson[1]

Synopsis

The principles of quantitative metallography are presented and the special problems involved in the application of the electron microscope are discussed. It is shown that the electron microscope can be used advantageously when the particle size is very small. Representative sampling and reproducibility are discussed and the results obtained are compared with those obtained by other methods.

Particle size, distribution, and relative amounts of microconstituents in metallurgical structures are usually estimated by examining a sample under the microscope or looking at a photomicrograph. This method provides information which is at best approximate and under certain circumstances may be completely erroneous. There are very few references in the metallurgical literature to the use of methods of quantitative microscopy. The method of visual estimation although widely used in metallurgy, is necessarily subject to considerable error. When the particle size is extremely large or the quantity of a phase is very high the values obtained may be reasonably accurate approximations, In most commercial steels, however, the distribution of the various phases is such that the structural elements are small and intermingled in such a way as to make visual estimation impossible.

A method of quantitative microanalysis using the light microscope was reported by Howard and Cohen (1)[2] in 1947. Although this method is a tremendous improvement over visual observation, it is of little value when the particle size of the structure under consideration is irresolvable with the light microscope. It is usual in commercially heat-treated steels for the microconstituents to extend in sizable numbers into the very small size range. Therefore, any method of microanalysis which is to be practically useful must overcome the limitation established by particle size.

The matter of resolution became more than a theoretical problem in 1947 when in the course of a study on steel for ball bearings it became necessary to determine the quantity of various phases in commercially heat-treated steel. It soon became apparent that if reasonable accuracy was to be obtained this work would have to be done with the electron microscope. The authors set about overcoming the many problems involved, and in this paper the principles of quantitative metallography are briefly reviewed and the special problems involved in the application of the electron microscope are described.

[1] Chief Research Physicist and Research Physicist, respectively, International Harvester Co., Manufacturing Research Dept., Chicago, Ill.

[2] The boldface numbers in parentheses refer to the list of references appended to this paper.

Quantitative Light Microscopy

Although metallurgists have only recently interested themselves in methods of quantitative microscopy, geologists and petrographers have been interested in the subject since 1848. Howard and Cohen (1) have presented an excellent survey of the literature in their paper, "Quantitative Metallography by Point-Counting and Lineal Analysis." The first method used was macroscopic and was reported by Delesse, who proved mathematically that in a uniform rock the volume proportions of various minerals are equal to the areal proportions as viewed on a random section. He measured these proportions by cutting out pieces of tin foil corresponding to areas occupied by the various minerals and weighing them. The weight of the foil corresponding to the mineral to be determined was divided by the total weight of foil corresponding to the entire structure.

The areal method was extended to microstructures by Sorby who used a *camera lucida* for tracing or drawing on paper of "uniform thickness" the outlines of minerals seen under the petrographic microscope. Sorby combined the method of Delesse with the *camera lucida* method by cutting and weighing the segments.

In 1903 Julien improved the precision by photographing the entire structure and weighing the paper segments of the micrographic print.

While the areal method was undergoing modifications, Rosiwal was developing the method of lineal analysis. In

1898 he published a paper on lineal analysis in which he showed that the volume proportions of minerals in uniform rock are equal to the lineal proportions intercepted by the minerals on a random line passed through the structure. He found good agreement with the areal method and demonstrated the applicability of lineal analysis to geometrically produced areas. Rosiwal stipulated that: (1) the length of the traverse must be at least 100 times the average diameter of the coarsest grain; (2) two traverses should not intersect the same grain; (3) the structural characteristics determine the number of traverses necessary.

In 1939 Hurlbut developed a semiautomatic electric counter. This counter is connected to the mechanical stage of a microscope by a flexible shaft. The counter is driven by an electric motor and has a keyboard counting device. In Fig. 1, the Hurlbut counter is shown attached to the electron microscope. Each key, when depressed, activates the flexible shaft, thus causing the specimen to pass under the cross hair of the microscope. Each key has associated with it a Veeder Root counter which tallies the number of revolutions while the key is depressed. The number of revolutions shown on each counter is proportional to the lineal distance traveled by the specimen while that key was depressed. Consequently, when the revolutions recorded when a key is depressed are divided by the total number of revolutions, the result is the volume fraction of a constituent. The speed of the driving motor can be varied with a rheostat and there are two reversing switches: one on the motor so that the counters may be turned back, and the other on the shaft so the traverse can be run in the opposite direction with the counters continuing their tallies.

The Hurlbut counter is only one of several devices that have been developed for the purpose of recording the cumulative lengths of particles of a given mineral, intersected during the traversing of a specimen under a microscope. Most frequently these devices use micrometer heads to move the specimen and record the traverse distance. The best known device of this type is the Wentworth counter. The Hurlbut counter is described here because it is the only device of this type which was suitable for use with the electron microscope.

Both the Wentworth and Hurlbut counters give better precision when a number of traverses are made. An error of ± 1 per cent is readily obtained. All methods of lineal analysis yield results on a volume basis; however, conversion to a weight basis can be readily made if the appropriate density values are available.

The method of lineal analysis developed by Howard and Cohen (1), using the Hurlbut counter with a light microscope, has been used to determine retained austenite. The reproducibility they reported was good, but it seems likely the results they obtained could not be duplicated unless the particles of austenite were sufficiently large to be easily resolved in the light microscope.

The importance of particle size in quantitative metallography with the light microscope is pointed out by Averbach, Castelman, and Cohen (2), when they say, "The technique (X-ray diffraction) is especially adaptable to finely dispersed austenite-martensite mixtures which are characteristic of commercially hardened steels and which are virtually irresolvable from a metallographic standpoint."

Quantitative Electron Microscopy

While various methods have been developed for determination of the quantity of microconstituents, all of these methods as used by petrographers and geologists are concerned with rather large grains. The lineal method as it was applied to the determination of retained austenite in steel doubtless benefited from the length and number of traverses that could be made on rather large samples. While the electron microscope does not suffer from the severe limitations established by particle size, the area which one can survey is rather small, and a continuous scan of an entire sample is impossible.

Naturally, our first problem was to find out if this difficulty would result in errors which could not be overcome. In other words, it was necessary to determine whether one could get statistically reliable results from a number of randomly selected small areas.

The structure which we chose for our preliminary studies was the spheroidized carbide structure in commercially annealed AISI 52100 steel. One of the reasons for this choice was the fact that good agreement with the light microscope had been established in a study of the carbide particle size in this steel (3). The samples were mechanically polished and etched with 4 per cent picral. Negative plastic replicas shadowed with chromium were used.

The size of a replica for the electron microscope is established by the design of the instrument. Other arrangements are possible and more desirable for this work, but the RCA model

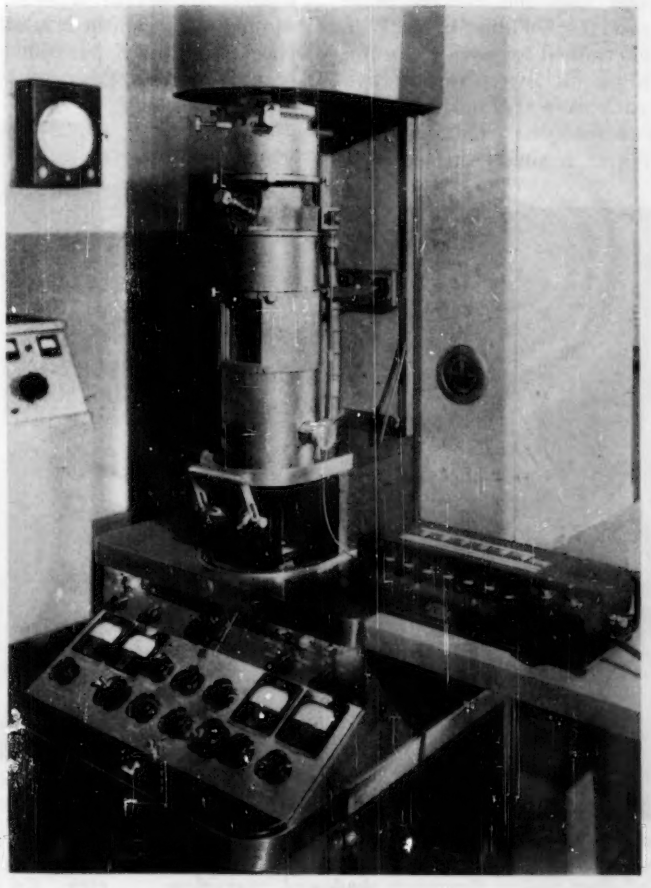

Fig. 1.—Hurlbut Counter Attached to the Electron Microscope.

TABLE I.—STATISTICAL DATA ON LINEAL ANALYSIS.

Determination	Surfaces	Replicas	Traverses	Mean, per cent	Standard Error	Accuracy of the Mean[a]	Number of Traverses for 65 per cent Probability[b]	Constituent
No. 1	1	1	8	21.0	0.25	0.59	1	Carbide
No. 2	1	5	10	21.4	0.47	1.05	3	
No. 3	10	10	10	19.2	0.77	1.72	7	
No. 4	1	1	10	2.85	0.18	0.40	1	Carbide
No. 5	1	10	10	2.90	0.22	0.50	1	
No. 6	10	10	10	2.50	0.28	0.62	1	
No. 7	1	1	10	23.1	0.25	0.56	1	Austenite
No. 8	1	10	10	25.0	0.52	1.18	3	
No. 9	10	10	10	21.3	0.54	1.20	3	

[a] 95 per cent probability that the mean is accurate within ± the per cent shown.
[b] Number of traverses necessary to give 65 per cent probability that the mean is accurate within ±1 per cent.

EMU Electron microscope used for this study accommodated a circular shaped replica about $\frac{1}{8}$ in. in diameter. A 200-mesh wire screen of this diameter supports the thin replica. The specimen movement mechanism restricts the area of the replica which can be viewed to about 6 by 6 mesh. This is indeed a small area of a sample, but the particle size is also small. Figure 2 shows that rarely does one encounter particles larger than 2 or 3 μ.

The method first reported by Julien was used in the early stages of this study: In this method a number of random exposures were made, and each exposure was enlarged photographically to a convenient size (approximately 20,000×). The areas of the photograph corresponding to the carbides were cut out with a razor-sharp knife. The carbides and the matrix were weighed, and the volume of carbide was thus determined for each exposure. From each replica five plates of five exposures each were obtained, and ten replicas were removed from randomly chosen areas of a single surface of a sample. Without going into the details of the statistics involved, it can be reported that this method of sampling proved to be highly reliable. A mean value of 19.5 per cent and a standard error of 0.244, were obtained. This gave 95 per cent probability that the mean is accurate within ±0.5 per cent.

Twenty determinations were made on this same sample in the following manner: The sample was mounted so that the surface would be longitudinal to the direction of rolling. The sample was polished and etched, two replicas were removed, and the sample was taken back to the coarse paper wheel and repolished. This was repeated twenty times. The values obtained ranged from 11.5 to 39 per cent giving a mean of 19.9 per cent. Several of these determinations were checked by making a duplicate set of replicas before the sample was repolished; in all cases they checked within 1 per cent. The effect of etching was explored by doubling the etching time, in which case the maximum value increase was 2 per cent. Only one 39 per cent value was obtained and the next lowest value was 26.8 per cent. These results indicate that in the case of commercially annealed steel the carbides are distributed in a very nonuniform manner and values obtained for a single surface are not reliable. When the sample was mounted so that the polished surface was transverse to the direction of rolling, the spread of values was not quite as wide but there was considerable variation from surface to surface.

A sample of plain carbon steel which had been quenched and tempered gave results which indicated that the distribution of carbides was far more uniform throughout the sample.

These results obtained with the cut-out method provided a sufficient basis for an attempt to apply the lineal method to the electron microscope. A description of the Hurlbut counter

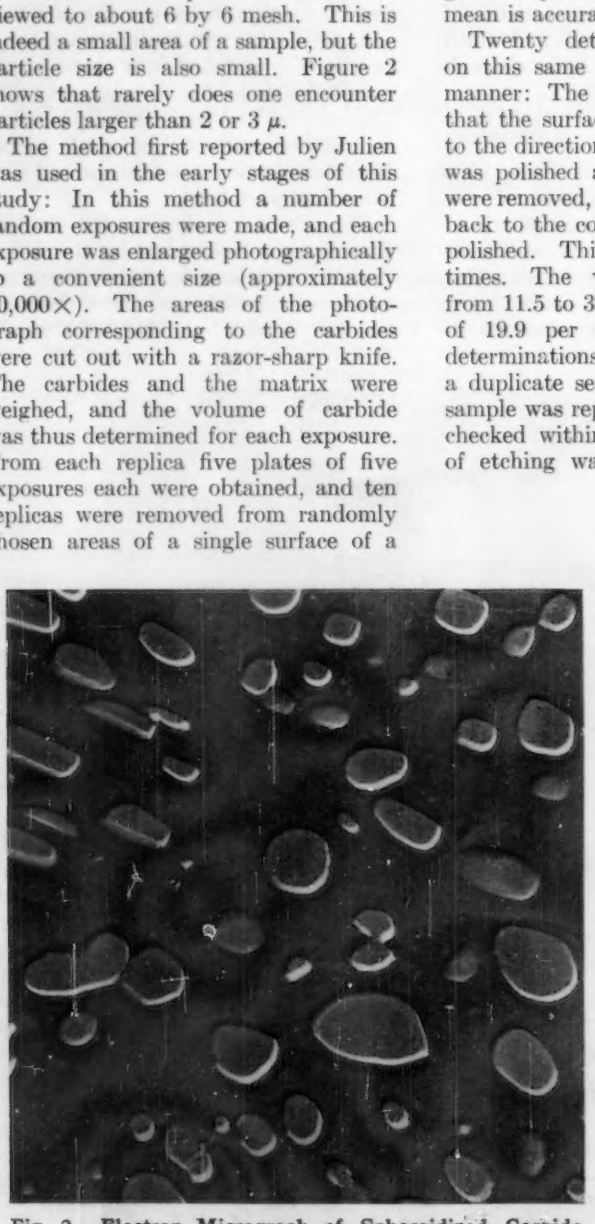

Fig. 2.—Electron Micrograph of Spheroidized Carbide Structure, AISI 52100 steel. Mechanical polish, picral etch. Collodion replica chromium shadowed, magnification approximately 8900 diameters.

Fig. 3.—Electron Micrograph of 0.5 Molybdenum, 1 Carbon Steel. Austenitized at 1650 F, quenched in oil at approximately 120 F, tempered for 1 hr at 300 F. The rough areas are martensite needles, the smooth areas are the austenite matrix. Mechanical polish, 4 per cent nital + 1 per cent zephiran chloride etch. Collodion replica chromium shadowed, magnification approximately 12,400 diameters.

is given above and Fig 1 shows it attached to the electron microscope. The flexible cable from the counter is attached to the right-hand specimen-movement screw without modification of the microscope. The left-hand specimen-movement screw remains attached to the normal manual control and provides movement of the specimen in a direction perpendicular to the movement due to the counter. It has been pointed out that a continuous traverse of the replica is prevented by the wires of the 200-mesh specimen support screen. Consequently, a series of short traverses was made diagonally across each mesh in such a manner that the distance covered totaled approximately 1000 μ. for each replica.

Several traverses of the same replica proved that good reproducibility could be obtained (see Table I). Several replicas from the same surface showed that the series of short traverses could be depended upon to give statistically reliable results.

All of the work to this point had been done on spheroidized carbides. This is the least controversial metallurgical structure in so far as electron microscope images are concerned. It was desired to attempt to use this method for the determination of retained austenite, since considerable data were available on austenite, obtained by another method.

The determination of retained austenite presented the problem of identifying martensite and austenite. Most of the electron micrographs which had been published up to this time did not show a very close resemblance to images obtained with the light microscope. However, in the course of a detailed investigation of this subject, it became apparent that under the proper conditions one could obtain electron microscope images which, aside from the improved resolution, resembled the image of martensite and austenite found in the light microscope.

Figure 3 is an electron micrograph of a sample of 0.5 per cent molybdenum, 1 per cent carbon steel which has been austenitized at 1650 F, quenched in oil at approximately 120 F, and tempered for 1 hr at 300 F. The plates or needles of martensite stand out clearly in a matrix of austenite. There is, however, no simple single technique which will make it possible to obtain clear images such as this under all conditions. Many factors are involved and the subject will be dealt with in detail in a future paper by one of the authors.

Samples were prepared and austenite determinations were made by the lineal method and the areal method (cut-out) and the values checked within 1 per cent. A value of 15 per cent was obtained for the sample studied. X-ray diffraction determinations on the sample, using the method of integrated intensities reported by Averbach and Cohen (**4**), showed that all three methods gave the same value within 1 per cent.

Table I shows the statistical data for nine determinations. Numbers 1, 2, and 3 are determinations on a specimen of AISI 52100 steel. Determination No. 1 in which eight traverses were taken on a single replica shows that only one traverse of a replica is necessary to give an accuracy of ± 1 per cent with 65 per cent probability. In determination No. 2, a total of ten traverses was made on five replicas, each replica being taken from a different position on a single surface. In this case three traverses are necessary to give the 1 per cent accuracy. In determination No. 3, ten replicas were taken from ten different surfaces and one traverse was made on each replica. Under these conditions seven traverses are necessary for the ± 1 per cent accuracy with 65 per cent probability. The increase in the number of traverses required for 1 per cent accuracy is not surprising. In determination No. 1, the only variation that exists is the variation over the area of a single replica. In determination No. 2, the variation of percentage of carbide over a single surface is considered and being greater than that of a single replica, the number of traverses for reliable results is increased. In determination No. 3, the variation through the whole specimen is taken into account. Naturally, for an accurate determination of an entire specimen this is the variation which must be considered. For this specimen seven traverses are necessary to give a mean which is accurate within ± 1 per cent with 65 per cent probability.

Determinations Nos. 4, 5, and 6 are from a heat-treated specimen of 1 per cent carbon, 5 per cent molybdenum steel containing less than 3 per cent carbide. In this case the particle size is much smaller and the distribution more uniform than for the larger carbide percentage and only one traverse from a single replica is sufficient to give an accuracy of ± 1 per cent with 65 per cent probability for the entire specimen. However, it is obvious that with a small carbide percentage, accuracy greater than ± 1 per cent would usually be desired and the number of traverses necessary would increase accordingly.

Determinations Nos. 8, 9, and 10 are austenite determinations from a specimen of 1 per cent carbon, 0.5 per cent molybdenum steel. As in the case of the first carbide determination, there is some variation through the specimen. However, the variation from surface to surface is almost the same as the variation found within a single surface. The particle size is smaller than that found in the carbide samples and the distribution more uniform. Only three traverses are necessary to give an accuracy of ± 1 per cent with 65 per cent probability.

It must be stressed that in order to secure reliable results, replicas must be discarded if they are anything short of perfect. Not only must they be clean and whole, but the specimen must be etched and the replica shadowed in such a manner that the particles are sharply and clearly defined.

We have found that good replicas will stand remarkably long periods in the beam without distortion. This is evidenced by determinations Nos. 1, 4, and 7 where as many as ten traverses were taken from a single replica and in no case was the standard error greater than 0.25. One traverse represents a time of approximately 1 hr.

Summary

It is not our intention to present the electron microscope as a cure-all in the field of quantitative metallography. It is an expensive and complicated instrument and requires highly trained personnel to operate it. The small field which can be analyzed restricts its application to those cases where the particle size is very small. However, in the very small size range it can provide information about particle size and quantity of microconstituents which cannot be obtained by any other visual method.

In so far as austenite is concerned, we hope to show as a result of a study now in progress that there are cases where the information obtained will be a valuable adjunct to X-ray diffraction data.

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Mathematical Analysis of Size-Frequency Distributions of Particles in the Subsieve Range

By E. E. Petersen,[1] P. L. Walker,[1] and C. C. Wright[2]

SYNOPSIS

A method is proposed for the calculation of surface area and weight distributions from microscopic size-frequency measurements wherein the necessity of assuming a mean diameter to represent the size interval has been obviated. This method permits the microscopic classification of particles into broader intervals than currently recommended, thereby reducing the time consumed in counting particles, especially when the sample contains a wide range of sizes.

In the method proposed, the size-frequency data are plotted in terms of the cumulative number of particles greater than a size x, N, *versus* x, from which intermediate values of N can be interpolated for any value of x. In the interval from x to $x + dx$, the number of particles may be represented by $-dN$. On this basis, equations can be set up which may be integrated between any interval limits to determine the surface area or weight of that interval. These equations have the form of $A_{12} = \int_{N_1}^{N_2} \beta x^2 \, dN$ and $W_{12} = \int_{N_1}^{N_2} \alpha x^3 \, dN$ for the surface area and weight, respectively, of the interval.

A statistical analysis of count data for coal samples with sizes ranging from 1 to 100 μ indicates that the reproducibility is sufficient to warrant calculations on the basis of the above method.

TECHNIQUES have been proposed by various investigators whereby properties such as size-frequency distribution, surface area distribution, weight distribution, and projected and total surface areas can be directly measured for subsieve size particles. Most of these techniques have been summarized in review papers (**1**, **2**, **3**, **4**, **5**).[3] In general, however, these techniques require calibration against some standard such as the direct classification of particles into size intervals under the microscope. While the size-frequency data are very convenient for calculation purposes, certain assumptions should be considered which have been required regarding the density of the particles, the shape factors, and the mean diameter (**6**) representing the size of the particles in each interval.

The density of the particles in each size fraction of the sample is required in order to determine the weight distribution. If the sample is homogeneous, no problem arises as the density is either known or can be determined. In the case of heterogeneous materials a useful expedient is to assume the constancy of density distribution throughout all size ranges; however, the results obtained are no better than the validity of this assumption.

The volumetric shape factor is defined as the ratio of the volume of a particle to the cube of any linear dimension of that particle. Examples of the linear dimensions commonly chosen are length, width, thickness, and equivalent Stokes diameter, but for each dimension, there is a corresponding shape factor defined by this relationship. As herein used, the volumetric shape factor α is defined as the ratio of the particle volume to the particle length cubed. In addition there are surface area shape factors which are defined analogously as the ratio of surface area to the square of the linear dimension. As herein used, the surface area shape factor β is related to the square of the length of a particle. A common expedient used in the absence of specific data is to assume the constancy of a particular shape factor throughout the range of particle sizes investigated. The validity of this assumption depends upon the nature of the material being analyzed.

The mean diameter is usually chosen as the arithmetic mean of the extremes of the size interval into which the particles are classified. As the size intervals are made smaller, this arithmetic mean diameter approaches more nearly the true mean diameter of each size interval. However, the smaller the size interval, the greater the time required to classify the particles under the microscope. Hence, the microscopic technique has lost favor with many workers because of the long task of getting the size-frequency distribution in intervals small enough to get reasonably accurate estimates of the mean diameter.

It is the purpose of this paper to present a new method of interpretation and calculation of size-frequency measurements from the microscope, offering two distinct advantages over methods currently in use, namely, (*a*) the problem of selecting a mean diameter to represent the interval counted has been obviated, and (*b*) the size intervals into which the particles are classified under the microscope have been greatly broadened, thus reducing the time consumed at the microscope.

As a basis for the method proposed, the microscopic counts are arranged in terms of the number of particles greater than a size x, $N(x)$ (or simply N since it is clear that N is a function of x), *versus* the size x. Intermediate values of N can be interpolated from a plot of N *versus* x, and the number of particles in any size interval can be approximately predicted. The number of particles in an interval from x to $x + dx$ may be represented by the value of $-dN$. Equations can then be set up which, when integrated between the limits of x_1 and x_2, will exactly represent the surface area and weight distributions.

DEVELOPMENT OF WEIGHT DISTRIBUTION EQUATIONS

Consider now the conversion of size-frequency data into weight distribution. The weight of M particles of a given size x is always given by the equation:

$$W = \alpha \rho x^3 M \quad \ldots\ldots\ldots\ldots (1)$$

where:

W = weight of particles of size x,
α = shape factor,
ρ = density,
x = any characteristic dimension of a particle, and
M = number of particles of size x.

Equation 1 is always true. However, count data are usually obtained by classifying the particles into size intervals (that is, say 5 to 10μ, 10 to 20μ,

[1] Research Assistant, Division of Fuel Technology, The Pennsylvania State College, State College, Pa.

[2] Professor and Chief of the Division of Fuel Technology, The Pennsylvania State College, State College, Pa.

[3] The boldface numbers in parentheses refer to the list of references appended to this paper.

etc.). From such data an approximation of the weight of particles in a given size interval may be obtained using the equation:

$$W' = \alpha\rho(x_{mean})^3 M \quad \ldots\ldots (2)$$

where:

W' = approximate weight of particles in the interval,
x_{mean} = arithmetic mean of extremities of the interval, and
M = number of particles in the size interval.

It is often desirable to express the results of a size distribution analysis as the weight fraction less than size x *versus* the size x. This follows readily by evaluating the weight of each fraction and expressing the sum of the fractions up to a size x and the weight of all the fractions as a ratio.

Equation 2 holds approximately if the $\alpha\rho$ product remains constant and if the size interval is small. It is clear that if the true mean diameter were known and substituted for x_{mean}, Eq 2 would hold exactly for broad intervals. However, there is no simple method for determining the value of the true mean diameter because it is a function of $x^3 dN$. The nature of this function will be shown later in Eq 6.

It would be extremely desirable to calculate the weight distribution without using a mean diameter. Such a method will now be presented. $N(x)$, or simply N since its functional dependence on x is understood, is defined as the number of particles greater than a size x. Then $N_1 - N_2$ is equal to the number of particles in the size range from x_1 to x_2 and $-dN$ represents the number of particles having sizes between x and $x + dx$. Therefore, the following equation can be written:

$$dW = -\alpha\rho x^3 dN \quad \ldots\ldots (3)$$

where dW is the weight of particles having sizes between x and $x + dx$.

Integrating:

$$W_{12} = -\int_{N_1}^{N_2} \alpha\rho x^3 dN \quad \ldots\ldots (4)$$

where W_{12} = weight of particles in the interval from x_1 to x_2 corresponding to N_1 and N_2.

Equation 4 is the most general form of the equation for the weight of particles between x_1 and x_2. A modification of this general equation can be made which has proved for many size distributions to allow more accurate evaluation because of the nature of the graphical integration. When Eq 3 is integrated by parts, Eg 5 results:

$$W_{12} = -\int_{N_1}^{N_2} \alpha\rho x^3 dN = -\alpha\rho N x^3 \Big|_{N_1, x_1}^{N_2, x_2} + 3\alpha\rho \int_{x_1}^{x_2} N x^2 dx \quad \ldots\ldots (5)$$

Equation 5 is a general form of the weight distribution equation involving only the assumption of constant $\alpha\rho$ product.

In theory, Eq 4 can be solved by plotting $\alpha\rho x^3$ *versus* N and evaluating the area under the curve from N_1 to N_2. This will represent the weight of particles from the corresponding values of x_1 to x_2. Unfortunately, in most cases N varies over such a wide range of values that a large error may be introduced for small values of N when using this method.

Equation 5 can be solved by plotting $\alpha\rho N x^2$ *versus* x. The area under the curve from x_1 to x_2 represents the value of

$$\alpha\rho \int_{x_1}^{x_2} N x^2 dx$$

The interesting characteristic of the $\alpha\rho N x^2$ *versus* x curve is that for the distributions with which the authors have worked, the magnitude of the $\alpha\rho N x^2$ term did not vary over threefold. Because of the relatively small variation in $\alpha\rho N x^2$, the accuracy of the weight calculations for all intervals remains nearly constant.

The value of the true mean diameter can now be determined from Eqs 2 and 4:

$$W_{12} = \alpha\rho[\text{true mean diameter}]^3 M = -\alpha\rho \int_{N_1}^{N_2} x^3 dN$$

$$\text{True mean diameter} = \left[-\frac{1}{M}\int_{N_1}^{N_2} x^3 dN\right]^{1/3} \quad \ldots\ldots (6)$$

However, the determination of true mean diameter requires that the weight of the fraction be first calculated, and since this is the object of the calculation, it is more convenient to omit the true mean diameter concept.

N Versus x Curve:

No mention has been made in the preceding discussion of how N might vary with x. When the nature of the function is such that an equation cannot be conveniently determined, a graphical integration is perhaps the best solution. However, if an equation of N as a function of x can be easily obtained, an analytical solution may be the shortest solution. An attempt was made to assume a weight distribution which many materials have been observed to follow and calculate the size-frequency distribution. With one minor exception, these attempts lead to expressions for which generalized solutions are not available. For example, assume a weight distribution to follow the generalized Rosin-Rammler equation:

$$r = e^{-(x/\bar{x})^n} \quad \ldots\ldots (7)$$

where r = weight fraction greater than a size x, and $\bar{x}$ and n are constants of the distribution.

If one attempts to evaluate N as a function of x beginning with the generalized Rosin-Rammler relationship it results in an integral which has its solution in terms of gamma functions.[4] However, in many cases the distribution of the smallest material in the complement for repeated mild fracture may be expressed by the modified form of the Rosin-Rammler equation (5) as follows:

$$1 - r = kx^n \quad \ldots\ldots (8)$$

where k and n are constants of the distribution.

Differentiating Eq 8:

$$dr = -nkx^{n-1} dx \quad \ldots\ldots (9)$$

where dr is the differential weight fraction of particles in the size interval from x to $x + dx$. If K is defined as the total weight of particles then Kdr is the differential weight of particles of size x which we have previously defined in Eq 3 as dW. Therefore:

$$dW = Kdr$$

$$\alpha\rho x^3 dN = Knkx^{n-1} dx$$

$$dN = \left(\frac{Knk}{\alpha\rho}\right) x^{n-4} dx$$

$$N = \frac{Knk}{\alpha\rho(n-3)} x^{n-3} + C$$

which can be written in the form:

$$N - C = Bx^p \quad \ldots\ldots (10)$$

where:

$$B = \frac{Knk}{\alpha\rho(n-3)}$$

$$p = n - 3$$

Therefore, if from the count data, log $(N - C)$ is a linear function of log x, the weight distribution will follow the modified form of the Rosin-Rammler equation. This section has dealt very briefly with an attempt to determine the size-frequency distribution if weight distribution was assumed. The authors believe that more investigation on this particular phase of the work may be of great value. It should be noted, however, that the failure to derive a completely general theoretical size distribution does not in any way affect the use of the proposed method, because the graphical integration can be performed without a knowledge of the equation of N as an analytic function of x.

[4] $N = -\frac{Kn}{\alpha\rho} \int x^{n-4} e^{-(x/\bar{x})^n} dx.$

The graphical solution is applicable in the general case when the distribution equation is unknown. Using the count data, a graphical solution of the last term of Eq 5 can be accomplished as follows: plot $\alpha\rho Nx^2$ *versus* x as shown in Fig. 1. The area of the small strip equals $\alpha\rho Nx^2\,dx$, and the sum of these small areas from x_1 to x_2 equals the total area under the curve. Therefore, in the proper units, this area can be used in Eq 5 to calculate the weight of particles in the interval from x_1 to x_2.

Development of Area Distribution Equations

By analogy to the weight distribution equations, surface area and projected area distribution equations also can be developed.

The surface area of M particles of size x can be determined from the following equation:

$$A = \beta x^2 M \quad \ldots\ldots\ldots (11)$$

where β = area shape factor.[5]

From similar reasoning to the development of Eq 3:

$$dA = -\beta x^2\,dN$$

$$A = -\int_{N_1}^{N_2} \beta x^2\,dN \quad \ldots\ldots (12)$$

A convenient form of this equation can be developed by a slight modification:

$$A = -\int_{N_1}^{N_2} \frac{\beta N x^2\,dN}{N}$$

$$A = -\int_{N_1}^{N_2} \beta N x^2\,d\ln N \quad \ldots\ldots (13)$$

Utilizing a plot of βNx^2 versus $\ln N$ from N_1 to N_2 the surface area of the particles from x_1 to x_2 can be calculated.

The above equations apply to the projected area of the particles if the shape factor, β, is changed to the shape factor, γ.[6]

[5] By definition: $\beta = A'/x^2$, where A' is the surface area per particle of size x.

[6] By definition: $\gamma = A''/x^2$, where A'' is the projected area per particle of size x.

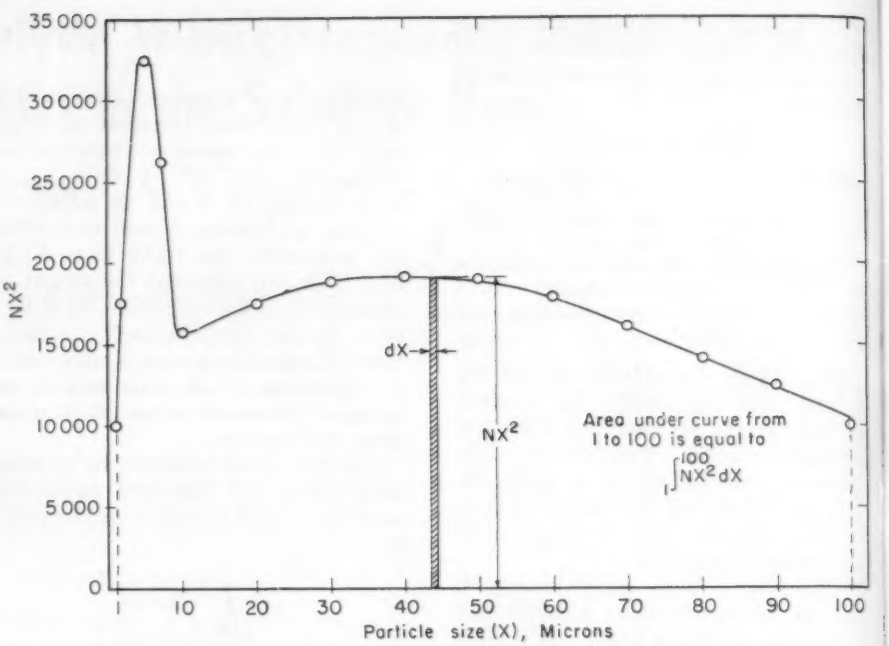

Fig. 1.—Auxiliary Plot Used in the Graphical Integration of Weight Distribution Equation for Run No. 1.

Applications of Equations to Theoretical Distribution:

The following example illustrates the use of the proposed method of calculation and compares the results with those calculated assuming an arithmetic mean diameter. The assumed distribution approximates that actually found for a sample of crushed bituminous coal. The distribution for the example is given in Table I and corresponds to a distribution found directly from microscope counts. The nature of the distribution was assumed so that the solution by the proposed method could be readily solved analytically, thus eliminating any possible source of error introduced by a graphical technique. For the sake of the example, assume the particles are spherical and have a specific gravity equal to one. The particular distribution chosen in this example conforms to Eq 10 previously derived. The value of p is -2 and represents the slope of the curve on a plot of log N *versus* log x. The value of B is 10,000 and can be interpreted as the number of particles counted that are greater than 1 μ. C for this case is equal to zero. Therefore:

$$N = Bx^p$$

$$N = 10{,}000x^{-2}$$

$$dN = -\frac{20{,}000}{x^3}\,dx \quad \ldots\ldots (14)$$

Substituting into Eq 4 for dN

$$W_{12} = \frac{20{,}000\pi}{(6)(10^{12})}\int_{x_1}^{x_2} dx \quad \ldots\ldots (15)$$

$$= (1.046)(10^{-4})(x)\Big|_{x_1}^{x_2} \quad \ldots\ldots (16)$$

where $\alpha = \pi/6$ for spherical particles, and $d = 10^{-12}\ g/(\mu)^3$.

The area distribution can also be calculated for the size distribution

TABLE I.—CALCULATION OF WEIGHT AND SURFACE AREA DISTRIBUTIONS FOR ASSUMED DISTRIBUTION.

A	B	C	D	E	F	G	H	I	J
Size Interval, μ	Number of Particles in Size Interval, M	(x_{mean})	$(x_{mean})^2$	$(x_{mean})^3$	log (x_2/x_1)	Weight of Particles in Interval, g		Area of Particles in Interval, sq. cm.	
						x_{mean} Method	New Method	x_{mean} Method	New Method
1 to 2	7500	1.5	2.25	3.37	0.301	1.32×10^{-8}	1.05×10^{-8}	5.30×10^{-4}	4.36×10^{-4}
2 to 5	2100	3.5	12.25	42.9	0.398	4.72	3.14	8.09	5.77
5 to 10	300	7.5	56.3	422	0.301	6.63	5.23	5.30	4.36
10 to 15	55.5	12.5	156.3	1 953	0.176	5.68	5.23	2.73	2.55
15 to 20	19.5	17.5	306.3	5 359	0.124	5.48	5.23	1.88	1.80
20 to 25	9.0	22.5	506.3	11 390	0.0969	5.36	5.23	1.43	1.41
25 to 30	4.9	27.5	756.3	20 797	0.0792	5.34	5.23	1.17	1.15
30 to 35	2.9	32.5	1056	34 328	0.0671	5.21	5.23	0.96	0.97
35 to 40	1.9	37.5	1406	52 734	0.0580	5.26	5.23	0.84	0.84
40 to 45	1.4	42.5	1806	76 766	0.0492	5.63	5.23	0.80	0.72
45 to 50	0.9	47.5	2256	107 172	0.0414	5.05	5.23	0.64	0.60
						55.68	52.30	29.14	24.53

$G = (0.523 \times 10^{-12})$ (BE). $H = (1.046 \times 10^{-8})$ (−A). $I = (3.14 \times 10^{-4})$ (BD). $J = (1.45 \times 10^{-3})$ (F).

given in Eq 14. From Eq 12 the area of a fraction is equal to

$$A = -\int_{N_1}^{N_2} \beta x^2 \, dN$$

where β equals π for spherical particles.

Substituting Eq 14 into Eq 12:

$$A_{12} = \frac{20{,}000\pi}{10^8} \int_{x_1}^{x_2} \frac{dx}{x}$$

$$= 1.45 \times 10^{-3} \log \frac{x_2}{x_1} \quad \ldots\ldots (17)$$

The calculations for weight and area distributions by the method of arithmetic mean diameters are based upon Eqs 2 and 10, respectively. In the latter equations, the arithmetic mean diameter of the interval is substituted for x. Since the values calculated by the new method are exact, the deviation of any value calculated by the arithmetic mean diameters from the exact value is a measure of the error introduced by the calculation method. Inspection of Table I shows deviations as high as 50 per cent for the weight of intervals and 40 per cent for the area of intervals. Moreover, the total weight calculated by the arithmetic mean diameter method is 6½ per cent high and the total surface area is 19 per cent high.

The surface area calculations are of especial interest because many important properties of dusts are related to surface area. The largest contributions to the surface area are from the small size particles, as shown in Table I. Also, the largest calculation errors are introduced in the small sizes, when using the method of mean diameters. Therefore it is here that the new method is of greatest utility, because in obviating the selection of a mean diameter, it affords a means of calculating accurately the area of particles where the major part of the total surface area is concentrated, that is, in the small size particles.

Application of Method to Microscopic Count Data:

The reliability of the calculations based upon the new method depends upon the experimental reproducibility of the count data. Therefore, an investigation was conducted using coal samples to determine the magnitude of variations characteristic of the microscopic sizing.

Count data as taken directly from the microscope consist of a series of counts which represent the number of particles classified in arbitrarily selected size intervals. In the subsequent discussion, these data will be interpreted in an attempt to evaluate how reliably such data can be considered representative of the actual distribution in the original sample. Because the actual distribution in the sample cannot be determined, the approach is of necessity based upon statistics.

There are many ways to compare count data statistically, but it seems sufficient here to treat the data in two ways. First, it is of value to compare the total number of particles counted in one field of the microscope with other fields of the same cell. A further comparison of the counts should then be made between fields of different cells. If the dispersion of particles within the cell is uniform and if the dispersion from which the cells were made up was uniform, the counts in each field should be identical. These counts will be referred to hereafter as the absolute count, and the number of particles counted in a given size interval will be likewise referred to as the absolute count of the size interval. A second comparison can be made between runs of the percentage of the particles counted greater than a size x. This is essentially comparing relative counts and will subsequently be referred to as such. Judgment as to the reproducibility of count data then will be based upon a statistical comparison of both the absolute and relative counts.

Preparation and Counting of the Cells.—Minus 200 mesh fractions from two similarly treated bituminous coal samples were each divided into three samples according to the ASTM Method of Sampling and Fineness Test of Powdered Coal (D 197–30).[7] These six 0.25-g composite samples were each subsequently analyzed microscopically.

The cells used for the microscopic analysis were each prepared by dispersing the 0.25-g sample in the quantity of n-propyl alcohol required to obtain a particle density suitable for microscopic sizing. One milliliter of this dispersion was then pipetted into each of five individual Sedwick-Rafter cells, allowed to settle overnight, and counts read the following day.

The particles in five fields of each cell were classified into intervals of 1 to 2, 2 to 5, 5 to 10, 10 to 20, - - - - , 90 to 100 μ where the particle dimension measured was the length. In addition, 50 fields per cell were counted classifying only those particles greater than 20μ because the number of particles in this range was small so that additional counts were necessary to increase the accuracy. By scanning the field of the microscope, the observer can count the particles lying within a given size interval with the aid of a small hand counter.

All counts were made using a mine safety appliance "Dust-View" microprojector equipped with a Spencer microscope. The lens system used was a 10× apochromatic objective and 10× and 30× compensating oculars. With the higher magnification it is possible to resolve particles smaller than 1 μ; however, no attempt was made to count particles smaller than 1 μ.

Presentation of Results.—Data presented in this section are the results of six microscopic analyses—three from each of the original two samples. Since these analyses are independent, a comparison of the magnitudes of the absolute counts is a measure of the experimental reproducibility of the analytical technique. However, the counts for a given size interval vary from field to field so that some statistical average values should be compared. Such a comparison was made wherein the arithmetic mean count was used and the standard deviation was utilized to determine the confidence limits of the count data (**8**).

The results obtained by applying this treatment to microscopic counts are presented in Table II. Analyses 1*a*, *b*, *c* and 2*a*, *b*, *c* are from the original samples 1 and 2, respectively. It should be noted that the data considered here are those less than 20 μ. There are two reasons for this: first, the counts fall off rapidly beyond 20 μ sizes; and, second, most of the surface area of the samples is contributed by particles less than 20 μ as was shown in Table I. The significance of the results presented is that $\overline{M}$, the arithmetic mean count of the interval, should represent the actual count of the interval to within $\pm z\sigma$, where $z\sigma$ is the confidence limit of the data. In-

TABLE II.—MEAN COUNTS, STANDARD DEVIATIONS, AND CONFIDENCE LIMITS FOR COAL SAMPLES ANALYZED BY MICROSCOPE

Interval	1 to 2 μ	2 to 5 μ	5 to 10 μ	10 to 20 μ
1*a*				
$\overline{M}$ (1)	34.5	18.5	4.0	0.6
σ (2)	7.2	4.1	2.0	0.8
$z\sigma$ (3)	2.5	1.4	0.7	0.3
1*b*				
$\overline{M}$	24.4	16.5	5.4	0.4
σ	3.7	3.8	2.3	0.7
$z\sigma$	1.3	1.3	0.8	0.3
1*c*				
$\overline{M}$	24.3	16.8	6.3	1.0
σ	4.3	3.6	2.5	1.0
$z\sigma$	1.5	1.3	0.9	0.3
2*a*				
$\overline{M}$	24.6	19.1	6.1	0.7
σ	3.6	5.6	2.4	0.7
$z\sigma$	1.3	2.0	0.8	0.3
2*b*				
$\overline{M}$	23.1	15.3	5.2	0.7
σ	3.0	4.2	2.1	0.9
$z\sigma$	1.0	1.5	0.7	0.3
2*c*				
$\overline{M}$	22.8	15.5	6.3	0.6
σ	2.1	3.8	2.5	1.1
$z\sigma$	0.7	1.3	0.9	0.4
Mean $\overline{M}$ avg[a]	23.8	16.6	5.9	0.7

[a] Omitting (*a*).
(1) Mean count. (2) Standard deviation. (3) Confidence limit (9 times out of 10).

[7] 1949 Book of ASTM Standards, Part 5, p. 610.

spection of Table II will show that with few exceptions the $\bar{M}$'s for the same interval compare within the confidence limit $\pm z\sigma$. The same data show that the ratio of $z\sigma/M$ increases with particle size. This illustrates that a representative count is more easily obtained when the number of particles in the field is large.

The complete sample analyses for the size runs are presented in Table III and are plotted in Fig 2. These data represent the relative counts based on 10,000 particles counted greater than 1 μ (or 100 times the percentage of particles greater than size x). To increase the accuracy of the counts for the larger sizes, 250 additional fields were read in which all particles greater than 20 μ were classified. The deviations in the larger sizes of the samples are more pronounced, again due to the difficulty in dealing with a small number of particles per field. However, larger errors can be tolerated here because the surface area contributions to the total are small for particles in this range.

The ultimate purpose of the counts was to calculate the surface area distribution of the particles and to determine to what extent the uncertainties in the microscopic counts would be present in the calculated total surface area. An estimation can be made using the values of the surface contributions of each interval to the total surface area found in the example illustrated in Table I. If the confidence limit of each interval is multiplied by the interval surface area and summed up, the total error can be calculated. On this basis the maximum probable error would be less than 12 per cent if the errors are additive. However, the deviations in Table II are random; therefore, the actual error would most likely be less than 12 per cent.

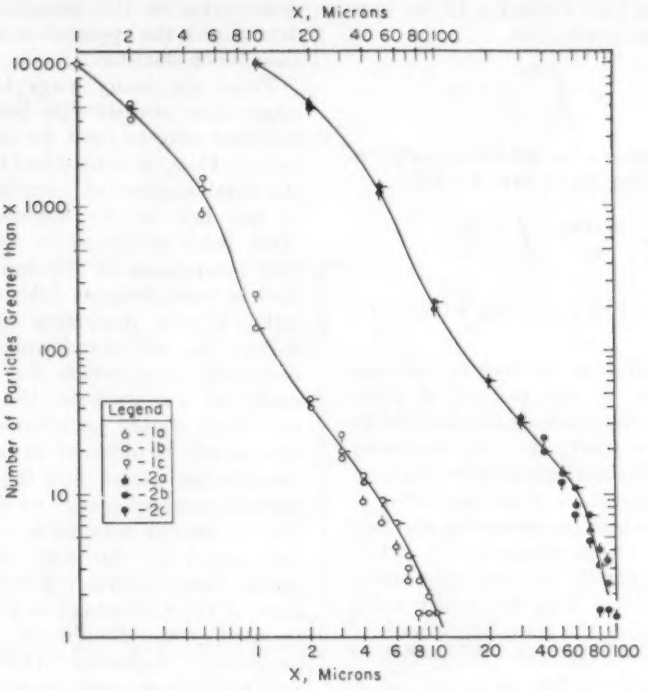

Fig. 2.— Plot of Number of Particles Greater Than Size *x* *Versus* Size *x*.

Summary and Conclusions

The magnitude of errors involved in the method of mean diameters was shown by means of a hypothetical example. The weight and area distribution calculations for the particular example chosen are known to be exact when the new method is used. Therefore, deviations from the exact values served as a measure of the errors possible by the method of mean diameters.

The weight and surface area distributions can be calculated from the distribution equations presented when a few values of N are accurately known as a function of x. Therefore, in using the proposed method the microscopic counts can be classified into broad intervals. Because the particles may be sized in broader intervals, the time required in microscopic sizing is greatly reduced. The calculations using the new method usually require more time than with the method of mean diameters, but this is more than offset by the reduced counting time.

It has been shown that it is desirable to utilize the new method of calculation when the surface area of the sample is important, because the largest contributions to the total surface area are from the small size particles which cannot be accurately estimated by the method of mean diameters.

A statistical analysis has been made of count data for six analyses, the confidence limits established for intervals from 1 to 20 μ, and the standard deviations evaluated for particles from 1 to 100 μ.

On the basis of the statistical analysis, it is concluded that the maximum probable error in the calculation of total surface area would be less than 12 per cent. Therefore, the count data are reproducible to a degree of accuracy sufficient to warrant the use of the new method of calculation.

Acknowledgment:

The authors wish to express their thanks to G. C. Williams for making

TABLE III.—RELATIVE MICROSCOPIC COUNTS.
Number of Particles Counted Greater Than x μ (Based on Total of 10,000 Particles).
Particle Diameter, x.

Sample		1	2	5	10	20	30	40	50	60	70	80	90	100	>100
1*a*	N[a]	10 000	3982	841.6	144.5	39.8	17.6	8.8	6.3	4.4	2.5	2.5	1.9	0	0
1*b*	N	10 000	4846	1325	145.7	45.7	19.3	12.3	9.2	6.14	3.8	1.5	1.5	1.5	0
1*c*	N	10 000	5015	1565	244.8	47.8	26.2	13.5	8.9	4.4	3.0	1.5	0.7	0.7	0
1 avg	N[b]	10 000	4610	1250	179	44.4	21	11.5	7.9	5	3.1	1.8	1.2	0.7	0
	σ[c]	0	474	305	55	3.4	3.7	1.6	1.2	0.81	0.54	0.46	0.48	0.61	0
2*a*	N	10 000	5056	1337	192.5	60.2	32.6	19.8	14.1	8.40	5.6	4.2	3.5	1.4	0
2*b*	N	10 000	4866	1376	211.2	60.2	31.2	19.8	14.2	11.2	7.2	3.2	2.4	0.8	0
2*c*	N	10 000	4986	1526	196	62	34.0	24.3	12.1	7.2	4.8	1.6	1.6	0.8	0
2 avg	N	10 000	4970	1414	200	61	32.6	21.3	13.5	8.9	5.9	3	2.5	0.1	0
	σ	0	107	80	8.1	1.8	1.21	4.4	0.97	1.67	1.02	1.07	0.78	0.28	0

[a] N is the number of particles greater than a size x.
[b] $\bar{N}$ is the arithmetic average of analyses N's from *a*, *b*, and *c*.
[c] σ is the standard deviation of N's from $\bar{N}$.

the microscopic counts and to H. L. Krall for his comments and suggestions on the method of presentation of the weight distribution equations.

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An Improved Water Extraction Test for Polyvinyl Chloride Elastomers

By E. F. Schulz[1]

Synopsis

An improved water extraction test for plasticized vinyl sheeting has been developed. The method is unique in that activated carbon is employed to overcome the low plasticizer solubility of a limited volume of the extractant.

In the development of the method it was found that water extraction is not increased by mere agitation of the water. However, when the water is continually refreshed at a high rate of exchange, the increase is pronounced. The presence of activated carbon in the water greatly increases the extraction. Static water extraction in activated carbon is approximately equal to extraction by continuous water exchange. Thus, saturation of the water with plasticizer can be avoided with activated carbon or by a continuous water exchange system. Of these, the use of activated carbon is the more feasible.

The water extraction in per cent is shown to decrease markedly with increased specimen thickness, increase exponentially with rising test temperature, increase with increased plasticizer content, and differ greatly between various plasticizer systems.

A definite correlation is evident between extraction tests by an existing method and the activated carbon technique. The precision of the activated carbon procedure is estimated at ±14 per cent with 95 per cent certainty.

Extraction of plasticizer by water plays an important role in the embrittlement, stiffening, and general service behavior in many applications for plasticized vinyl compositions. Examples of such applications are garden hose, wire insulation in wet installations, shower curtains, raincoats, beach inflatables, and generally where films are exposed to water or require washing. Even though most quality film and sheeting marketed today exhibit characteristically low water extractability, it is necessary that sound techniques be available for the evaluation and development of improved plasticizers and compounds.

Present water extraction test methods are unsatisfactory in several respects. Primary among these is the notoriously poor test precision. This and other deficiencies have made the development of an improved test method mandatory. The new techniques employed are an outgrowth of a volatility test method recently proposed to the ASTM by the Society for the Plastics Industry.

The objective throughout this work has been to provide an empirical tool of immediate practical value for evaluating relative extractability rather than to establish the precise fundamental mechanisms of extraction.

Test Procedure

For routine determinations the following procedure is recommended for evaluating relative plasticizer extractability by water:

1. Precondition duplicate 3 by 3 by 0.075 ± 0.005-in. specimens in a barium oxide desiccator at 60 C for 24 hr.

2. Weigh the specimens immediately after removal and pack into a glass jar with activated carbon so that each specimen is completely surrounded by at least 1/2 in. of carbon. Use only 6/14 mesh prewashed activated carbon[2] which has been tested for nonalkalinity.

3. Cover the specimens and activated carbon with deionized water, and place the assembly in an atmosphere of 85 C for 6 days.

4. Then remove the specimens, wipe dry, and postcondition for 24 hr in a barium oxide desiccator at 60 C before final weighing.

5. Reweigh the sample and calculate the per cent weight loss due to extraction.

If desired, physical tests such as brittleness, stiffness, or tension may also be performed on the specimens.

Discussion

When plasticized compositions are subjected to prolonged water immersion, plasticizer is extracted into the water. First, plasticizer is removed from the surface of the material by solution into the water. This disturbs the plasticizer equilibrium of the sample and initiates a migration of the plasticizer to the region of lower concentration at the surface. The migration and solution continue until the water is saturated or until equilibrium has been restored.

[1] Bakelite Co., a Division of Union Carbide and Carbon Corp., Bound Brook, N. J.

[2] "Columbia" Grade AC activated carbon granular, 6/14 mesh. Carbide and Carbon Chemicals Co.

Thus, the mechanism of extraction is essentially one of solubility and migration or diffusion. The solubility of most plasticizers in water is known to be low (1)[2] and the diffusion of most plasticizers in the plastic is relatively high (2). In water extraction the solubility of the plasticizer is, therefore, the primary or controlling factor.

In the search for an improved test method, and in recognition of the low plasticizer solubility of water, attempts were made to accelerate the solution of the plasticizer by agitation of the water. This was done by suspending triplicate 3 by 3-in. specimens 1 in. apart in a museum jar containing approximately 3 liters of water and keeping the water in a state of vigorous turbulence with agitators. Parallel tests were run with the water static. The data thus obtained for a tricresyl phosphate (TCP) and di-2-ethylhexyl phthalate ("Flexol" DOP) plasticized vinyl chloride - vinyl acetate copolymer (VYNW) composition are given in Table I. These data show that agitation of a confined volume does not increase extraction loss and therefore does not effect any noticeable acceleration in removal or solution of the plasticizer.

Activated carbon has been used successfully in removing plasticizer from the surrounding atmosphere during volatility tests. A similar approach to water extraction proved equally successful in keeping the plasticizer from saturating the extractant. This is demonstrated by Fig. 1, where comparative weight loss data are shown for tests which have been run in (*a*) water only, (*b*) with a small quantity of activated carbon, and (*c*) with the sample completely covered with carbon. It is seen that extraction is increased by the addition of a small quantity of activated carbon and is further increased by completely covering the sample in activated carbon. Complete carbon coverage of the sample apparently yields more efficient absorption of the extracted plasticizer. The activated carbon thus removes the plasticizer from the water and makes possible the solution of larger quantities of plasticizer without allowing the water to become saturated. In this way the severest service conditions are approached. All subsequent tests were, therefore, run with samples completely packed in activated carbon.

[2] The boldface numbers in parentheses refer to the list of references appended to this paper.

TABLE I.—EFFECT OF AGITATION UPON WATER EXTRACTION.
(Per cent weight loss after 6 days at 85 C)

Composition, per cent	Thickness, in.	Static	Agitated
40 DOP-VYNW	0.166	0.19	0.20
	0.080	0.25	0.25
35 TCP-VYNW	0.158	0.47	0.47
	0.085	0.48	0.52

Initial difficulties were posed by the alkalinity of the activated carbon. It was found that neutral water becomes alkaline with the addition of untreated activated carbon, reaching a pH as high as 10. However, this alkalinity can be removed by vigorous washing in tap water. Removal of the alkaline content in the extractant is essential to sound weight loss measurements. Significantly higher extractions are observed for some plasticizers if the extractant is alkaline.

If activated carbon in water acts as a plasticizer absorbent only, similar extraction results can be expected when water is exchanged continuously. This was verified experimentally. Cold tap water was passed over the samples at a rate of 5.7 gal per min. Simultaneously samples covered with activated carbon and water and in a sealed jar were placed in the same water stream to assure identical test temperatures. A 35 per cent DOP-VYNW formulation was subjected to these conditions for 7 days. The extraction losses measured are 0.30 ± 0.01 per cent for the activated carbon packed and 0.26 ± 0.01 per cent for the specimens subjected to continuously changing water. Although a statistically real difference exists between the two conditions, it is noteworthy that this difference is small, and that the continuously exchanged water results closely approach static (activated carbon covered) water extraction. Conceivably the agreement might be improved by increasing the water velocity. We conclude, therefore, that the use of activated carbon approaches conditions of continuously exchanging and refreshing the extractant.

When a material is immersed in water it is subject to both extraction of plasticizer by the water and water absorption by the material. The weight gain due to the absorption must be experimentally separated from the weight loss brought about by the extraction. This is accomplished by drying and weighing the specimen before immersion, and drying and then weighing the specimen after immersion. The

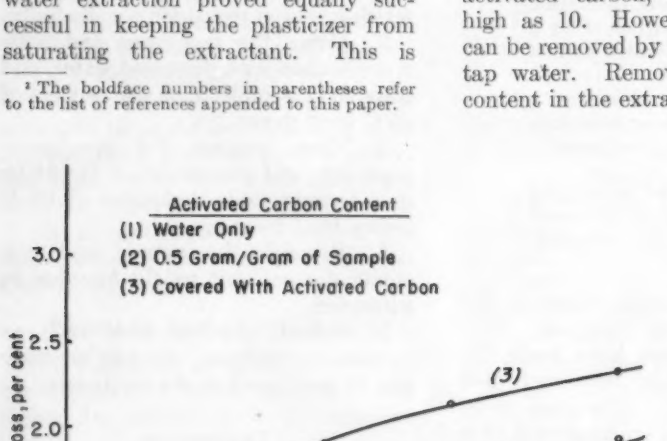

Fig. 1.—Effect of Activated Carbon Content Upon Water Extraction.

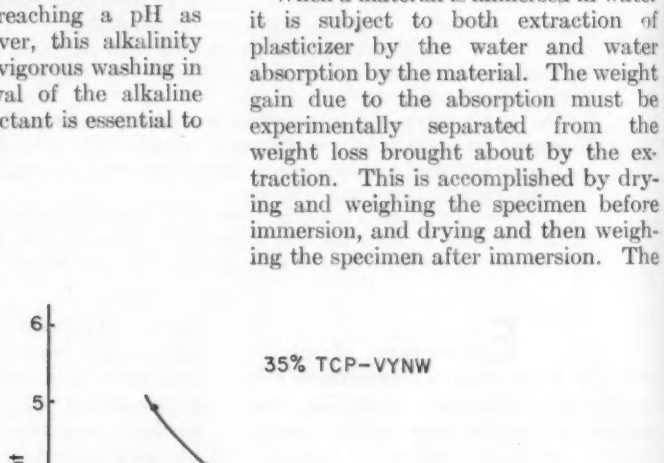

Fig. 2.—Effect of Specimen Thickness Upon Water Extraction.

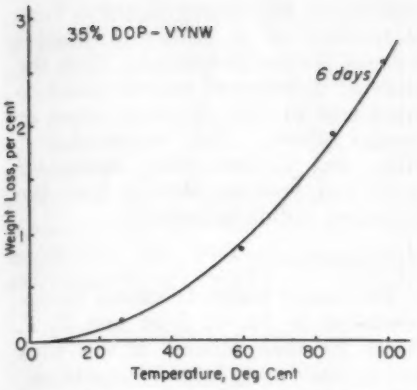

Fig. 3.—Effect of Temperature Upon Water Extraction.

drying removes any absorbed water and allows the true extraction weight loss to be measured. Of several drying techniques investigated, a 24-hr period at 60 C in a barium oxide desiccator proved most effective.

It is generally recognized that specimen thickness influences extraction test results. This was studied quantitatively. The per cent weight loss of various thicknesses, of a 35 per cent TCP-VYNW formulation at 85 C, is shown in Fig. 2. Here the expected decrease in per cent weight loss with increased specimen thickness is apparent. The opposite trend is obtained when calculating the weight loss on a per unit area basis. Hence, the weight loss cannot be normalized by either scheme. Practically, however, we can specify a narrow thickness range within which extraction measurements can be considered independent of thickness. For this a thickness of 75 ± 5 mils is recommended, with the weight loss expressed in per cent. This thickness range is conveniently common to a number of other tests.

Only sheeting thicknesses are considered in this test procedure because (*a*) specimens are self supporting and easily manipulated, (*b*) a greater weight loss, which in turn can be measured more precisely, is attained even though percentage-wise this weight loss is less, and (*c*) it is desirable to have a total plasticizer content of sufficient magnitude not to distort the extraction characteristics by plasticizer exhaustion. The plasticizer loss must be kept low in the interest of consistent diffusion behavior. Although fairly heavy sheeting thicknesses are preferred, it is generally possible to obtain satisfactory results from films.

A study of the effect of temperature yielded the anticipated exponential increase in per cent weight loss with increased test temperature. This is demonstrated quantitatively in Fig. 3, where a 35 per cent DOP plasticized VYNW composition has been studied at 23, 60, 85, and 100 C for 13 days. Excessive discoloration and specimen shrinkage in the order of 4 per cent was noted on the specimens exposed to 100 C. From the standpoint of shrinkage, thermal degradation, and high weight loss, a test temperature of 85 C is deemed desirable for routine evaluations. An arbitrary exposure time of 6 days has also been selected.

Three concentrations of DOP plasticized VYNW have been tested by the indicated procedure to establish the plasticizer sensitivity of the test. The data of Fig. 4 show the sensitivity to be good.

An estimate of the test reproducibility has been made from ten test replications obtained over an extended period of time on a 35 per cent DOP-VYNW compound. The precision calculated from these data, for an average of two individual readings, was ±14 per cent with 95 per cent confidence. The estimate is restricted in that all data were obtained by one operator on one formulation. The precision is nevertheless good for this type of test.

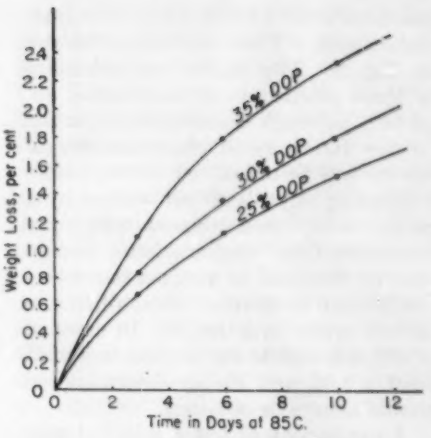

Fig. 4.—Effect of DOP Plasticizer Concentration Upon Water Extraction.

The extraction-time characteristics of Tri-2-ethylhexy Phosphate ('Flexol' TOF), Di-2-ethylhexyl Phthalate ('Flexol' DOP), Tricresyl Phosphate (TCP), Polyester ('Paraplex' G-50 and 'Flexol' R2H), Di-2-ethylhexyl Adipate (A-26), and Methyl Phthalyl Ethylglycolate ('Santicizer' M17) plasticizers in 35 per cent concentration com-

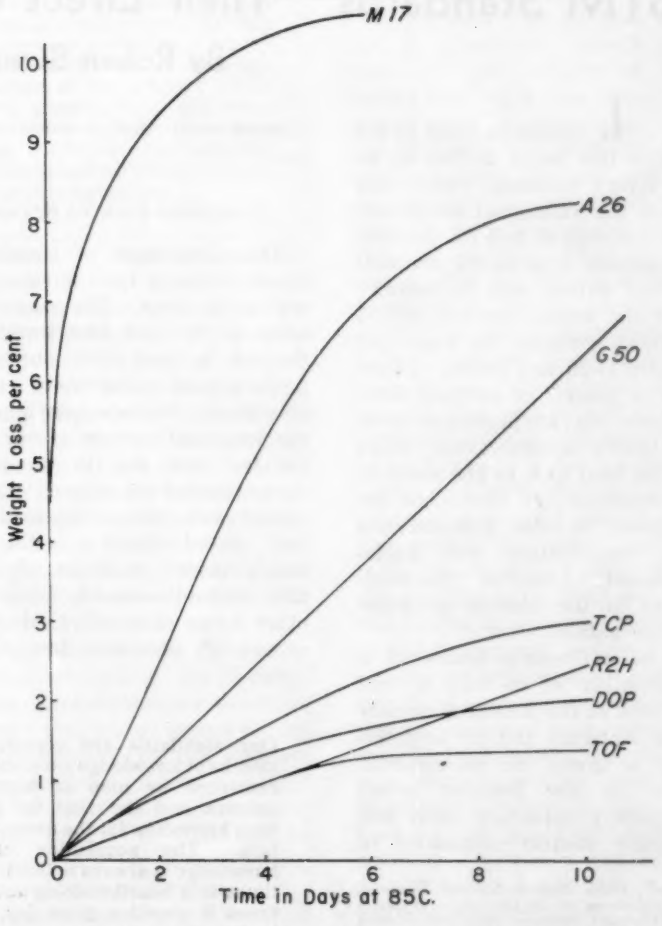

Fig. 5.—Water Extraction of Various Plasticizers (35 per cent Concentration in VYNW Resin).

pounded with VYNW resin have been determined. These curves are shown in Fig. 5. The relative extractability of these plasticizers is immediately apparent, although considerable variation in the fundamental characteristics of curves will be noted. However, before evaluating any plasticizer system by a single 6-day measurement only, the extraction-time characteristics should first be obtained to assure a consistent comparison at all time levels; otherwise serious errors may result. In cases of doubt, a complete curve consisting of at least a 3, 6, and 10-day determination should always be obtained.

A comparison of test results between an existing water extraction test (3) and the proposed activated carbon procedure has been made. The former procedure involves a 10-day test period in water at 23 C with 3 hr pre- and post-drying in a 60 C oven. Extraction data by this method were compared to the activated carbon results of seven plasticizers. The data are shown in Fig. 6 with the weight losses by both procedures plotted on a log-log basis.

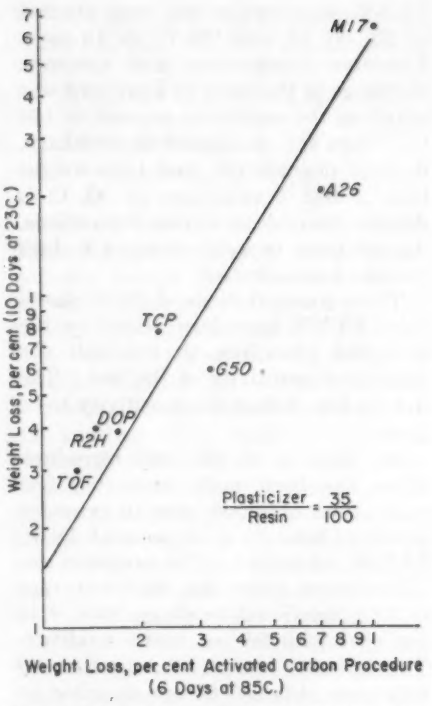

Fig. 6.—Correlation Between Water Extraction Tests.

Despite the high degree of scatter there is evidence of a definite correlation between the two techniques. Thus, the presence of activated carbon cannot be considered to exert any inconsistent or foreign effects. The reproducibility, time, and freedom from extractant saturation, however, strongly favor the activated carbon procedure.

Acknowledgment:

The author wishes to extend his appreciation to M. C. Reed and E. F. Smith for their interest in this work and for their many helpful suggestions.

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ASTM Standards—Their Effect on Plastics Technology*

By Robert Burns[1]

IT WOULD be laboring the obvious were this paper to live up to its title. Every textbook, every data sheet attests the wisespread acceptance of ASTM methods of test on plastics. Every laboratory, even to the remotest parts of our nation and in faraway sections of the world, has the ASTM booklet which contains the standards of Committee D-20 on Plastics. Many thousands of pounds of molding compounds, sheets, etc., are purchased every day by D-20's specifications. High courts of the land look to the committee for definitions. It represents the United States in the International Standards Organization and guides the Secretariat (American Standards Association) in the plastics activities of thirty-two nations.

Instead of a tiresome review of a *de facto* situation let us take a brief but closer look at the American Society for Testing Materials and try to determine why a group of unimportant individuals (in the popular sense) on a completely voluntary basis and with a single weapon—mutuality of interest—can wield a world-wide influence.

Comforts Due to Standards

The advantages of standardization to our citizenry both in peace and war are quite clear. The success of our arms in the last two world conflicts derived in part from our ability to produce great quantities of interchangeable parts. Perhaps more important for the long-haul success of our nation is the fact that due to standardization the lowliest of our citizens enjoys material comforts comparable to the wealthiest. Standardization is the technical man's answer to those who proclaim that share-the-wealth programs and other forms of socialistic humbug can accomplish economic tranquility. By standardization the technologist aims at raising the lowly, not at depressing the more fortunate.

Our standards are comprised of chunks of knowledge assembled and cemented by men of high competence and the zeal for pooling their know-how for the common welfare. The acquisition of true knowledge is always tedious. Sometimes it is heartbreaking and many times it provides great joy, but it is always slow.

In order that a man of limited means may purchase an electric light bulb quite as beautiful and quite as brilliant as his millionaire townsman, it is necessary not only to insure that the thread will fit any socket on either side of the railroad track, but to control the materials which guarantee the transparency of the glass, the brilliancy of the filament, and the quality of the electrical insulating materials which give equal protection to the user be he rich or poor. This is the job of the organization we affectionately refer to as ASTM.

ASTM "Workings"

The American Society for Testing Materials was organized in 1902, and well organized it was, for in 50 years it has become the world's outstanding influence in its field. To explain this phenomenon would take volumes if indeed it could be done at all, but an insight of the workings of this unique organization as applied to plastics will be quite typical of all industrial materials as will as supply the essential ingredients of the Society's success story.

* Presented at the Eighth Annual National Technical Conference of the Society of Plastics Engineers in Chicago, January, 1952, and printed with the permission of SPE.

[1] Bell Telephone Laboratories, Murray Hill, N. J.

From the viewpoint of smooth writing it would be comforting to say, "The hard core of ASTM is the Technical Committee." Alas, it isn't true. There is a written set of by-laws, a democratic tradition and a spiritual discipline, without which the Technical Committees would be rather helpless. All these elements, and many more, coexist in mutual helpfulness. None could survive alone, and we jolly well know it.

Committees D-9 and D-20

ASTM is no Johnny-come-lately in plastics science and technology. Method D 48 covering Tentative Methods of Testing Molded Materials Used for Electrical Insulation was originally issued in 1917 and is still going strong, in modernized dress, for the evaluation and procurement of phenolics. Most of us think of dielectric constant and power factor as new and mysterious phenomena in electronics, but the Society had standardized the measurement of these properties thirty years ago when many of our modern-day experts in electronics were noisy members of the diaper set.

Until the middle thirties the work on plastics was done by Committee D-9 on Electrical Insulating Materials and was devoted primarily to the thermosets. In 1937 the Society created Committee D-20 on Plastics, granting to these amazing materials the autonomy and prestige which they had rightfully earned. The committee was fortunate in the caliber of its early sponsors, all top-drawer professionals—the names of Emley, Evans, Richardson, Zinzow, Gibbs, and Kline come to mind.

Our Technical Committees such as D-20 on Plastics are not responsible, in technical matters, to any super-board of stuffed shirts. For obvious reasons, not the least of which is inter-industry harmony, their standards are channeled through the Administrative Committee on Standards, a group of experienced men who are beholden to no one but their consciences, or submitted at general sessions of the Society. If the standard has been promulgated through genuine democratic procedures, approval by the Administrative Committee is assured.

Appealing Characteristics

The Society is unique in many respects, but some of its characteristics are appealing to the scientific mind. To name a few:

1. Although the consumer members hold the whip hand, the producers do all the work. (This is a scandalous oversimplification but the generalization is sound). It is a fine tribute to the technical integrity of our producers and to their everlasting patience.

2. The brass hats of industry, government, and education are required to pour millions of dollars into ASTM work but are granted practically no control over the results. This is contrary to some widely held theories of economics but indicates that our executives are long-range, solid thinkers, willing to sacrifice the quick buck to the over-all good of their industry.

3. When the chips are down, for example in a final Committee D-20 vote, a great industrial empire and a little consumer in Podunk have one thing in common—each is allowed one vote.

4. ASTM is not a trade organization, government agency, or professional society, yet it contains among its active members the finest technicians from all. It provides a congenial atmosphere where scientific men solve their common problems within the framework of the Society's purpose: "The promotion of knowledge of the materials of engineering, and the standardization of specifications and the methods of testing."

A member may not be completely happy with the final decision, but we've learned from experience that what makes us individually happy is not necessarily best for the long-haul welfare of the industry. You may rest assured that this little flurry will not be permitted to undermine the solidity of our technical ranks or deteriorate the friendliness of our future cooperation.

5. Within broad limitations imposed by Society regulations, Committee D-20 writes its own rules and elects its own officers. The President of the Society and the Board of Directors are not consulted and don't want to be. The scope of any committee's activities is generally decided within the committee except where a jurisdictional overlap may occur (for example, between plastics and rubber) when the Board may be asked to act as referee.

6. The plastics committee is administered by plastics men exclusively, the steel committee by steel men, etc. They all owe allegiance to the family of industries comprising the Society, but in their own field they are the court of last resort and are so recognized by the other industries. By this arrangement each industry draws technical strength from the others. For instance, the plastics committee drew heavily in the early years on metals testing know-how and instrumentation.

7. In committee work a man is judged by what he knows and not by what position he occupies in his company. We don't care whether he's president or bottom-rung occupier. If he knows his stuff, he's our boy.

8. The typical ASTM'er is an interesting anomaly: he's a compromiser who abhors compromise. He'll beat his brains out trying to accommodate his viewpoint to that of others in a sincere effort to achieve technical unity, but just let him suspect shenanigans of some sort and you'd better watch out!

9. Although the Society is considered primarily an industrial group, a recent tabulation showed a company membership of more than 1900 and an individual membership of over 5000.

ASTM—A Group of People

ASTM is not a super-colossal piece of machinery but a group of people. Therefore one feels right at home at a meeting. There's the fellow who always votes NO, however meritorious the project; the man who insists we are not accomplishing enough but who is always too busy to help; and the character who is sure there is a better way to do a job but can't quite recall what it is. Life would be dull indeed without these gentlemen. They add the spice of humanism to what might otherwise be a rather austere existence.

In common with all American families, we occasionally have a good old-fashioned fight. Matter of fact we're having one right now concerning our procurement specifications. Some of our members feel that determination of the physical, electrical, and chemical performance of molded test specimens is an unnecessary hardship on the producer of plastics. They say, in substance, "Let us impose a few identification tests on the molding powder and let the molder assume the responsibility for making good parts." Other members say, "No, because correlation between the constants of the molding powder and the performance of molded parts has not been established. If highly trained technicians can't make good test specimens, how can we expect the molder to make good parts?"

We can be sure of this: the dispute will one day be resolved and the result will receive unanimous approval; all of us will be required to take a good look at the other fellow's position and to adjust our sights accordingly. A member may not be completely happy with the final decision, but we've learned from experience that what makes us individually happy is not necessarily best for the long-haul welfare of the industry. You may rest assured that this little flurry will not be permitted to undermine the solidity of our technical ranks or deteriorate the friendliness of our future cooperation.

Criticism Too Slow?—Too Complicated?

ASTM is continually subjected to two criticisms: (*a*) it is too slow, and (*b*) its test methods are too complicated and too costly for the little man of industry. We accept the impeachment and should like to enter the following pleadings:

In the matter of speed: perhaps the principal source of ASTM's power and prestige is unanimity; although the by-laws provide that a standard must be approved by a $\frac{2}{3}$ vote, tradition requires that the approval be substantially unanimous. In Committee D-20 on Plastics we take particular pains to eliminate every single negative vote. Therefore when a technician in Montana or in Louisiana reads one of our standards he is assured that, be it good or bad, it has been approved unanimously and does not represent the will of a noisy majority or a mere consensus. This takes time, but the building of strength always takes time.

Our standards are comprised of chunks of knowledge assembled and cemented by men of high competence and the zeal for pooling their know-how for the common welfare. The acquisition of true knowledge is always tedious. Sometimes it is heartbreaking and many times it provides great joy, but it is always slow.

Fitting the chunks together is likewise laborious. Each method may contain several scientific or engineering areas of knowledge such as hydraulics, thermodynamics, mechanics, or rheology, not to mention the psychologic reactions of the man who is going to use the method, that is, how much theory shall be included? Shall we write for his as a novice or as an expert? Shall we define each word or is he familiar with terminology? Shall we give him some historical background, the whys and wherefores of the method?

Some Tests Simple—Others Have To Be Complex

In the matter of simple tests: scientific men as a whole lead uncomplicated lives; therefore, we may well wonder at the complexity of some of their methods of test. Not all tests are complicated; water absorption, for example, can be determined with an oven and analytical balance, well within the resources of even the smallest of laboratories. Dimensional stability of plastic films can be measured with a template costing a few cents, an oven, and a steel rule. So we must assume our critics refer to such tests as strength and electrical properties where expensive equipment and expensive people are required.

Many plastics are moisture sensitive and in addition all are affected by temperature. A reasonable degree of reproducibility from laboratory to laboratory, without which a standard is useless, compels the use of conditioning equipment which is always a nuisance, frequently expensive, and should be operated only by experienced professionals. We have found no simple and easy way to accomplish such conditioning.

In measuring flexural strength, the basic principle of which is the simple beam—we have a situation where the machine must be of massive proportions to provide rigidity and to insure that we are measuring the specimen and not the equipment: the weighing system must be accurate (each pound of load represents 30 psi); the application of load must be smooth and at closely controlled speed; a load-deflection curve (for computing modulus of elasticity) must be obtained, preferably by autographic means, and the machine should be (for most plastics) in an air-conditioned room.

For measuring d-c conductivity or a-c power losses, the equipment is delicate and expensive. Since the insulation resistance of a paper-base phenolic may be several millions of megohms at 20 per cent relative humidity and a few hundred megohms at 90 per cent relative humidity the necessity for control of atmosphere is obvious. The a-c losses in a material such as polystyrene are extremely low and their measurement defies the ingenuity and skill of the laboratory technician. Delicate electronic voltmeters, accurate oscillators, and elaborate shielding are indispensable. For measuring dielectric strength, not only is the measuring apparatus costly but the protection of personnel imposes extra financial outlay.

The desire for so-called "quick and dirty" tests is not new, and over the years special committees, study groups and task forces have wrestled with the problem. The result is always the same: in making them cheap and quick we invariably make them too dirty. In other words they are not good.

It would afford some satisfaction to say to our critics, "O.K. you come in and tell us how to do it. After all, ASTM is not a closed corporation, it's not a private fight, come on in and tell us." To be sure, we'd like to have them join us; frankly, we need their help. But nothing is gained by baiting our critics. The dullest of us knows that the more simple our methods, the more they'll be used. The more they are used the more knowledge we'll possess, and knowledge is the only commodity the technical man has to sell.

Effect of Standards

In assessing the effect of ASTM standards on plastics technology, one might compile impressive statistics; one might say, for example, that the heat distortion test—D 648—was used umpteen thousand times in 1951. So what? We ASTM'ers are more interested in whether or not the test helps us to understand plastics more fully, or helps us procure better plastics for our applications, or promotes a state of commercial tranquillity between producer and consumer. To be sure, umpteen thousand times in 1951 is presumptive evidence of usefulness. But the true scientific man is not satisfied; he drives himself toward improvement regardless of statistics. Taking Standard D 648 as just an example, several industrial laboratories throughout the nation are working diligently on revisions which will eventually be incorporated in the method.

Perhaps we take this whole business of responsibility to our technical colleagues too seriously. Nevertheless the sincere ASTM'er finds it quite disconcerting to walk into a nice shiny laboratory in some far away corner of our nation and discover several high-class technicians with their noses deep in a well-thumbed method which the visitor had a hand in writing. There is a temptation to exclaim, "Look, boys, the method isn't *that* good. It's weak in several places. I ought to know, I helped write it. It's the best we know but it isn't perfect. So go easy, this is not Revelations; it's just the best effort of some ordinary people, and not very bright ones either!"

But of course the ASTM'er keeps his thoughts to himself. He feels grateful rather than proud, and returns to his home laboratory determined to justify the faith of those whose professional affections he cherishes and whose high talents he envies.

BOOK REVIEWS . . .

Vinyl and Related Polymers

DR. CALVIN SCHILDKNECHT's book is an excellent and compendious collection of up-to-date information on the preparation, properties, and applications of vinyl and related polymers. The book surveys the field of addition polymers and copolymers from vinyl monomers in an orderly, concise, and interesting manner. Throughout this book, the theoretical and mathematical treatments of vinyl polymerization have been kept to a minimum; emphasis has been given to the practical and industrial aspects of the subject. The polymerization and copolymerization of styrene are presented in the initial chapters to acquaint the novice with the fundamentals of polymer science. Subsequent chapters deal with styrene derivatives and related polymers; methacrylic and acrylic ester polymers; acrylonitrile, acrylic acid, and related polymers; polymers from vinyl acetate and related monomers; vinyl chloride polymers; vinylidene chloride and fluorovinyl polymers; ethylene high polymers and copolymers; high polymers and copolymers of isobutylene; vinyl ether polymers; sulfur-vinyl compounds; nitrogen-vinyl polymers; and vinyl ketone and miscellaneous polymers.

The preparation of this volume is the result of more than five years of concentrated effort on the part of Dr. Schildknecht and his assistants. Features worthy of special attention are the chapters on ethylene high polymers and copolymers and vinyl ether polymers. The references are well selected and the text is well grounded on experimental facts. With the exception of a few misspelled names and an occasional mistake in patent references, the book does not contain any real deficiencies or serious errors.

This book, replete with graphs, tables of physical properties, and more than 4000 references, covering the literature from 1835 through the first half of 1951, is an invaluable and indispensable source of information and reference to chemists, engineers, physicists, and other scientific people interested in research, development, manufacture, and application of vinyl polymers. A great service has been rendered to those who would like to keep abreast of the new developments in this important and rapidly expanding field.

Copies of this 733-page volume can be obtained from John Wiley & Sons, Inc., New York, N. Y., price $12.50.

HOWARD M. RIFE

Mechanics of Vibration

GROWING out of a course in Vibration Analysis which has been offered for several years by the Department of Engineering Mechanics at the University of Michigan, H. M. Hansen and P. F. Chenea present in this book the fundamental theory of vibration in a manner that is neither too elementary nor too advanced.

Divided into three parts, *Mechanics of Vibration* deals first with steady-state vibration of systems of one degree of freedom. Since these systems are fundamentally significant in most forms of vibration, a considerable amount of space is devoted to them.

The second part of the book extends the theory to systems of several degrees of freedom. The theory is discussed from the classical standpoint, although emphasis is placed on the extremely useful "mobility" concept.

The third section consists of an introduction to special topics, which are an essential part in a more general and refined analysis of vibration problems. These topics include nonlinear systems, systems with distributed physical characteristics, and systems subjected to transient motions. While a thorough discussion of these topics is beyond the scope of this book, the authors, who are members of the teaching staff, Department of Engineering Mechanics, University of Michigan, believe that an introduction to these subjects is desirable to link the idealized and more exact theories.

Although designed for use as a textbook, this 400-page treatise would be of use to anyone interested in the fundamental concepts of vibration.

Copies of the book may be obtained from John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. The price is $8.

Effect of Vibration on Air Content of Mass Concrete

THE publication of a report by the Waterways Experiment Station of the Corps of Engineers is announced, dealing with a subject which should be of considerable interest to ASTM members in the cement and concrete fields. This report, Waterways Experiment Station Technical Memorandum No. 6-345, entitled "Effect of Vibration on Air Content of Mass Concrete," covers studies made on the effect of high-frequency and moderate-frequency vibration on the amount and distribution of entrained air in mass concrete. Nominal air contents of 3, 6, and 9 per cent in that portion of the mix passing the 1½-in. sieve were used. Measurements were made in the change in unit weight of plastic concrete and microscopic inspection of cores drilled from hardened specimens of the concrete containing 6 per cent air.

Conclusions were reached based on these tests that the air content of mass concrete can be seriously affected by improper use of either a high-frequency or a moderate-frequency vibrator. Severe coarse aggregate segregation and uneven air distribution and loss can occur for the same reason. Copies of this report may be secured from the Waterways Experiment Station, Corps of Engineers, Vicksburg, Miss., at a cost of 50¢.

Materials Technology for Electron Tubes

ONE of the most important industrial fields today, both to civilians and to the military, is that of electron tube manufacture. This book is one of the first books in English which aims at the scientific treatment of the main solids which enter into the construction of electron tubes. The contents give a fair idea of the scope of the book covering such things as physics, annealed strength, analysis and electrical conduction of glass; glass to metal and ceramic to metal seals; tungsten; molybdenum; tantalum; nickel; copper; ceramics and mica; soldering and brazing; carbon and graphite; thermionic emission. Each chapter of the book has been critically reviewed by research workers in their respective field. Many of these reviewers are active and well known in ASTM work. The tube engineer, experimental physicist, materials engineer, and technician in any field where these materials are being used, can get from the book the pertinent data required. In addition each chapter contains a selected list of references to facilitate a more extensive study of the literature.

Walter H. Cole, the author, is a consultant to the Director of Research, Collins Radio Co., Cedar Rapids, Mich.

This 500-page book is available from the Reinhold Publishing Corp., 330 W. 42nd St., New York. The price is $10.

1952 British Institute Standard Methods for Testing Petroleum and Its Products

THE Institute of Petroleum, London, has issued the 12th edition of its *Standard Methods for Testing Petroleum and Its Products*. A supply of this significant 1952 book is maintained at ASTM Headquarters in line with a reciprocal agreement with the British Institute and copies can be obtained promptly from ASTM.

There are 121 methods covering some 650 pages. Wherever there is a comparable ASTM method, this is noted. Two new methods, Oxidation Stability of Aviation Gasoline and Oil Content of Soluble Cutting Oil Dispersions, are included and, in order to achieve uniformity in the form of setting out the methods, 68 of the existing methods have been revised editorially. In over 20 methods, technical revisions have been made, and the range of analytical solvents for which specifications are given has been widened. Where applicable, IP standard thermometers are specified, graduated in either Fahrenheit or Celsius scales. There is an alphabetical list of the methods, a numerical list, and a helpful subject index. Specifications are given for various petroleum products and for hydrometers and thermometers. Among the appended material is the Report of the Standardization Committee which provides pertinent news on work under way by the various committees, the personnel of which is listed.

Copies of this 774-page book, heavy paper cover, page size 5½ by 8½, are available at $5.60 postage prepaid.

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